

MAY 1952

PRICE 35 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING

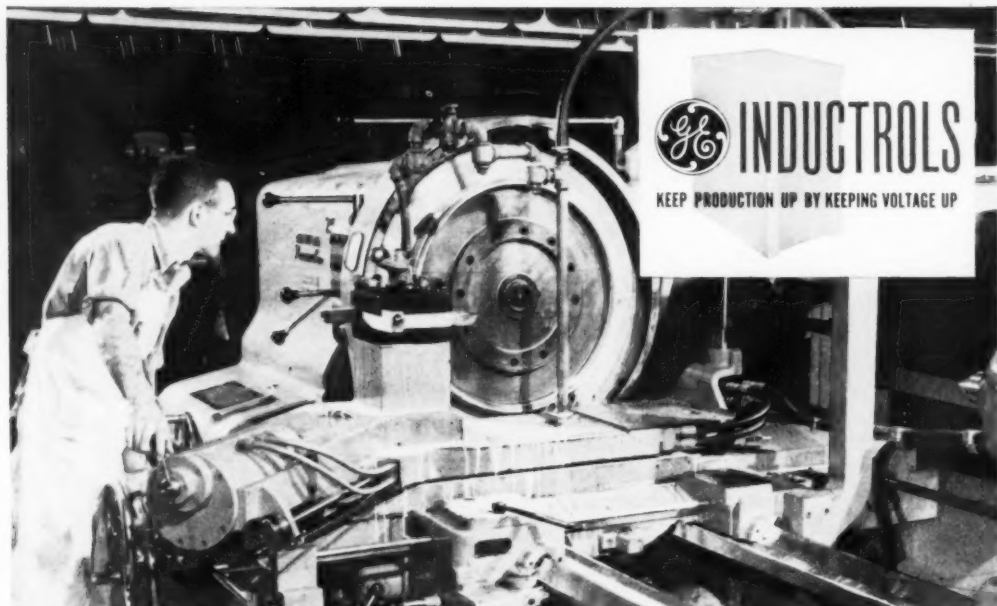
PITTSBURGH'S giant construction program featured in this issue provides a comprehensive case study in modern electrical construction technology. The new Gateway Center group (right) and the Heinz plant (below) are typical of the commercial and industrial developments setting new standards in electrical construction and maintenance of world-wide significance.



A MCGRAW-HILL PUBLICATION

51

ST YEAR



Good Lamp Voltage Saves You Money!

Reduce lamp replacements . . . Maintain high production and quality workmanship with proper lighting.



G-E INDUCTROLS can be obtained for both manual and automatic operation, and both single- and three-phase circuits in sizes from 3 kva, 120 volts up to 500 kva, 600 volts.

Your plant lighting operates most efficiently at rated voltage. Undervoltage reduces the brilliance of all your lamps, and workmanship suffers. Overvoltage increases your lamp replacement costs.

That's why it pays to install G-E Inductrols. These new dry-type voltage regulators automatically maintain correct voltage for your plant lighting and other electric equipment, thus assuring peak op-

erating efficiency. All-steel cabinets, attractively styled, protect personnel by completely enclosing all live parts.

For more information on Inductrols, contact your local G-E sales representative or authorized agent. Write for bulletins GEC-712, GEC-795 and GER-341, *General Electric Company, Schenectady 5, New York.*

404-90

HOW POOR VOLTAGE LIMITS YOUR PLANT EFFICIENCY

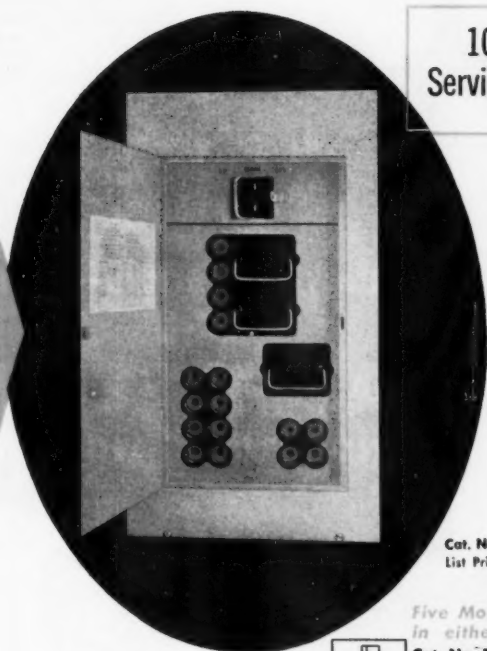
LAMP TYPE	10% Undervoltage	10% Overvoltage
Incandescent	Cuts light output 30%	Life cut 70%—Triples replacements.
Fluorescent	Cuts light output 10%; lamps may go out or fail to start.	Lamp life shortened drastically and unpredictably depending on frequency of starting, type of ballast, etc.
Mercury Vapor	Light output cut 15 to 25%; lamps go out with 15% undervoltage.	Even 5% overvoltage overheats lamp—shortens life. May damage lamp transformer.

G-E Inductrols are ideal for light-dimming applications

GENERAL  ELECTRIC

ANOTHER
NEW

Murray
PRODUCT



100 Ampere
Service Equipment

HERE'S A "Packaged" SOLUTION TO INCREASING LOADS

Murray's "Combination" units will solve your main switch and distribution panel problems—

1 THEY PROVIDE BOTH SERVICE ENTRANCE AND BRANCH DISTRIBUTION IN ONE UNIT.

These Murray "Combination" service entrance and branch distribution units provide 100 Ampere main circuit breaker, fusible range and water heater pullouts, lighting and appliance plug fuse branch circuits—with or without a dryer pullout!

2 THEY PROVIDE FOR GROWING ELECTRICAL LOADS.

Any one of these five compact units offers a packaged solution to increasing loads. They are ideal for small commercial and large residential installations.

3 THEY SAVE TIME AND MONEY IN INSTALLATION.

Murray "Combination" units will save you time and money all along the line. Just one unit to buy—just one unit to install—just one unit to wire!

Factory bussing makes these units easy to wire. There's plenty of wiring room and all K. O.'s are conveniently located. Hook-on cover uses only two screws. Compact! Only 12-7/8 inches wide, designed to fit between building studs.

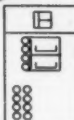
4 THEY GIVE DEPENDABLE CIRCUIT PROTECTION AT ALL TIMES.

Fully magnetic circuit breaker main consists of two independent trip, 1 pole, 100 Ampere 120/240 volt AC fully magnetic circuit breakers. Carries full rated load continuously. Handle bar permits simultaneous manual tripping to "off".

Murray's well-known fusible pull-out construction provides positive electrical contact. One piece fuse clip and blade prevents overheating.

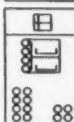
Cat. No. PC316A
List Price — \$74.00

Five Models to Choose from
in either surface or flush.



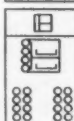
Cat. No. PC212A

100 Ampere main, fully magnetic circuit breakers
60 Ampere range fusible pullout
30 Ampere water heater fusible pullout
12 plug fuse branch circuits
List Price — \$57.00



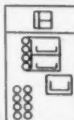
Cat. No. PC216A

100 Ampere main, fully magnetic circuit breakers
60 Ampere range fusible pullout
30 Ampere water heater fusible pullout
16 plug fuse branch circuits
List Price — \$64.00



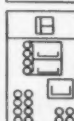
Cat. No. PC220A

100 Ampere main, fully magnetic circuit breakers
60 Ampere range fusible pullout
30 Ampere water heater fusible pullout
20 plug fuse branch circuits
List Price — \$71.00



Cat. No. PC312A

100 Ampere main, fully magnetic circuit breakers
60 Ampere range fusible pullout
30 Ampere water heater fusible pullout
12 plug fuse branch circuits
List Price — \$67.00



Cat. No. PC316A

100 Ampere main, fully magnetic circuit breakers
60 Ampere range fusible pullout
30 Ampere water heater fusible pullout
30 Ampere dryer fusible pullout
16 plug fuse branch circuits
List Price — \$74.00



Write for full
information to:

MURRAY MANUFACTURING CORPORATION
1250 ATLANTIC AVENUE • BROOKLYN 16, N.Y.

Service Entrance & Meter Equipment • Fully Magnetic Circuit Breakers • Switches (Types A, C and D)
Current Limiting Reactors • Crows' Nest Aerial Ladders



Twin Highlite—For high levels of illumination from a minimum number of outlets in high bay industrial interiors. Available with porcelain enamel or Alzac aluminum finish.



SAVE

Money—Materials—Man-Hours

with

APPLETON

INDUSTRIAL LIGHTING

V-51 Convertible Vapor-Light Fixture—Exclusive Unit Assembly makes receptacle, globe, guard instantly detachable for relamping. Converts to higher or lower wattages just as easily.



Type EFU—First and still finest Explosion-Proof Lighting Fixture. Available for two 40 Watt, 48" lamps or two 100 Watt, 60" lamps.

Pat. No. 2,393,202



RLM Standard Dome Reflector—Made of Rust-resisting iron with three coats of baked porcelain enamel. Sectionalized construction permits easy installation, convenient servicing.



Stocklite—Provides perfect illumination for shelves and bins in stock rooms.

Fewer rejections . . . increased worker output . . . greater safety . . . less spoilage resulting from eye fatigue—these are only a few of many advantages that are yours with good plant lighting.

Appleton Industrial Lighting Equipment is precision-engineered to direct the *right intensities* of light to the *right places*. Combining expert Appleton design with rugged durability, these fixtures provide finely coordinated lighting systems at minimum initial cost and lowest possible service and operating expense.

Appleton excels in the manufacture of lighting equipment for hazardous locations and explosion-proof applications. For any industrial lighting requirement, contact Appleton, pace-setting manufacturer of electrical equipment for nearly half a century.



Sold Through Electrical Wholesalers

APPLETON ELECTRIC COMPANY

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Export Representatives: International Standard Electric Corp., 67 Broad St., New York 4, N. Y.

MALLEABLE IRON CONDUIT FITTINGS

APPLETON
OUTLET BOXES AND SWITCH BOXES

ELECTRIC
INDUSTRIAL LIGHTING EQUIPMENT

PRODUCTS
EXPLOSION-PROOF FITTINGS • REELITES

ELECTRICAL CONSTRUCTION AND MAINTENANCE

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

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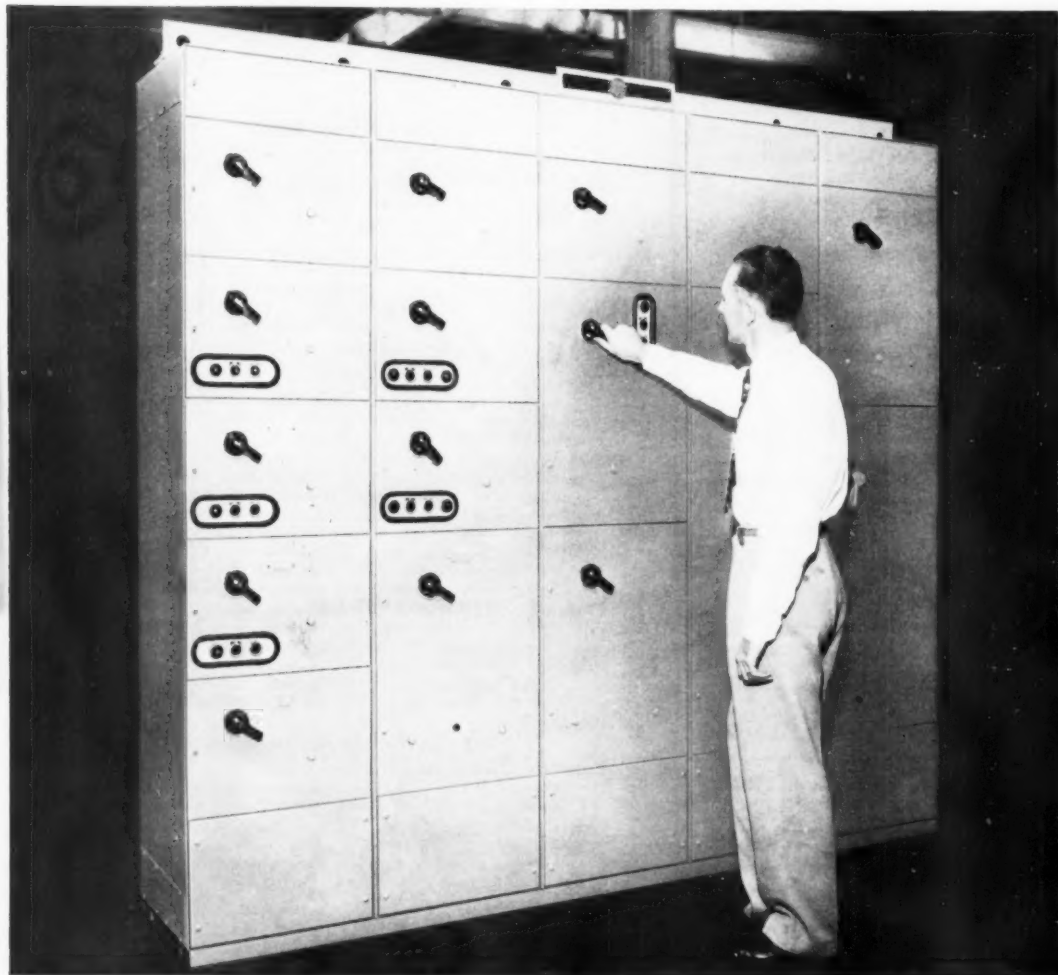
For centralized control with greater flexibility

Announcing

Here's an attractive, versatile new motor control center that you can easily plan, install, and service. Compact—a section is only 20 inches wide, 20 inches deep, and 90 inches high. It will accommodate NEMA Size 1 through 4 starter units back to back.

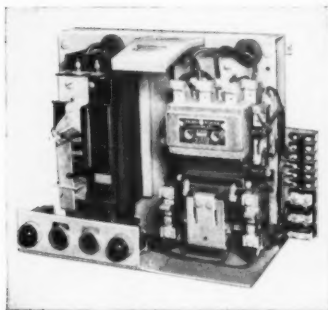
A four-inch wiring trough provides ample space for outgoing wires and cables. Starter units are designed for easy inspection and servicing.

There are many provisions for protecting personnel from mechanical and electrical injury. This G-E motor control center has also been laboratory tested to assure protection against 25,000 amperes short-circuit current. More information on this new, modern motor control center in bulletin GEA-4979A. Write your nearest G-E office today. *General Electric Co., Schenectady, N. Y.*

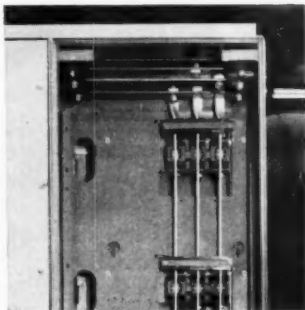


THIS COMPACT, ATTRACTIVE, G-E MOTOR CONTROL CENTER provides the most modern method of controlling a-c motors up to 200 horsepower from a central location.

the NEW General Electric Motor Control Center



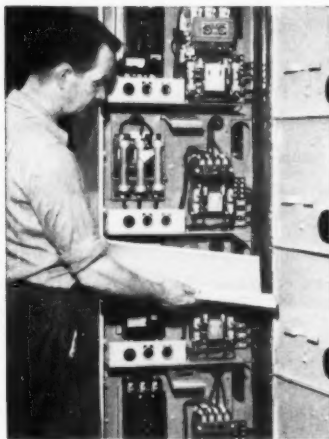
STARTER UNITS ARE COMPLETELY ACCESSIBLE. All components—even the pilot devices—are mounted on a sturdy frame with all terminals front connected.



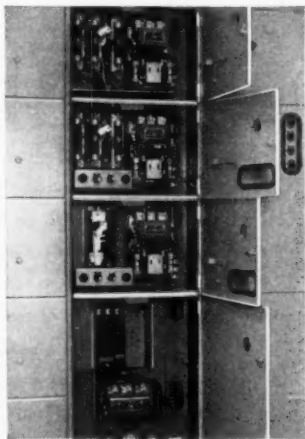
DESIGNED TO PROTECT PERSONNEL. Rear view shows metal barrier that separates starter unit space from bus bars. Vertical section features new "I-beam" construction for strength.



EASY TO INSTALL AND INSPECT. Sturdy, light-weight starter units are easy to handle, and interchangeable because of standardized dimensions and components.



EASY TO WIRE. Ample four-inch wiring trough is completely accessible by removing horizontal metal barriers between units. Barriers isolate and support units as they are slid into section.



VERSATILE. Starter unit sizes and types are in even multiples of 14 inches. Fusible and circuit breaker combinations of the same starter size are interchangeable without changing doors.



EASY TO SERVICE. Doors swing wide (no hinge wiring); unit is easily disconnected from bus and held in test position for protected servicing.

GENERAL  ELECTRIC

Wakefield Industrial PACEMAKER

READ THESE IMPORTANT FACTS ABOUT THE INDUSTRIAL PACEMAKER

1 The Wakefield Pacemaker transmits about half the light up, half down.

2 The downward light can be shielded efficiently by louvers, if desired. (Shielding of 25°-35° is provided.) Fleur - O - Lier classification—G-40-20-2-P.

3 Channels, channel covers, end panels, side panels and louvers are of heavy gauged steel.

4 All metal parts are processed, prior to finishing, with DURIDINE, a modern phosphatic and cleaning agent which "bonds" the white enamel durably to the surfaces.

5 ETL approved, brick type ballasts deliver full rated lamp watts and insure full light output. This feature permits the use of fewer fixtures per square foot of room area.

6 All reflecting surfaces turn downward, and do not readily retain dust. Lamps are readily removed and replaced. In the bi-pin types, starters are accessible without removing lamps. Tests show the Pacemaker can be cleaned in half the time required for the average fixture of like size.

7 The Pacemaker is designed for continuous mounting but may be mounted singly also. Support chains permit suspension of almost any distance from the ceiling.

8 The Pacemaker is designed to use either bi-pin (40W) or Slimline fluorescent lamps.

As a leader in the design and manufacture of drafting room and office lighting equipment, The F. W. Wakefield Brass Company has contributed importantly to the realization of the over-all visual environment as an aid to human efficiency and physical comfort.

Now Wakefield introduces the Industrial Pacemaker—a rugged steel luminaire which transmits about half the light up onto the ceiling, to be reflected downward in an over-all distribution pattern remarkably free from glare, shadows and sharp brightness contrasts. Such a light distribution is basic to the creation of a comfortable visual environment, whether in factory, drafting room or office. We'd like to send you a folder on the Industrial Pacemaker, giving detailed information. Write to The F. W. Wakefield Brass Company, Vermilion, Ohio.

Wakefield Over-ALL Lighting



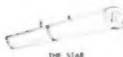
THE GRENADEER



THE PACEMAKER



THE COMMODORE



THE STAR



THE WAKEFIELD CEILING

Complete Control and Protection for Your Motors

ONE ATTRACTIVE easy-to-install steel cabinet is all you need between line and motor when you specify Allis-Chalmers Type H Starters. Contactors, protective devices, meters, relays . . . everything you need for complete control and protection of your motors is built into Type H Starters. You get:

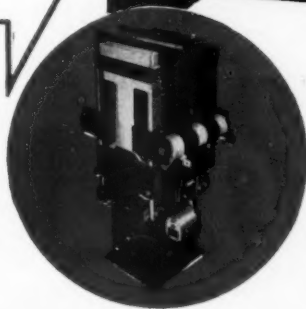
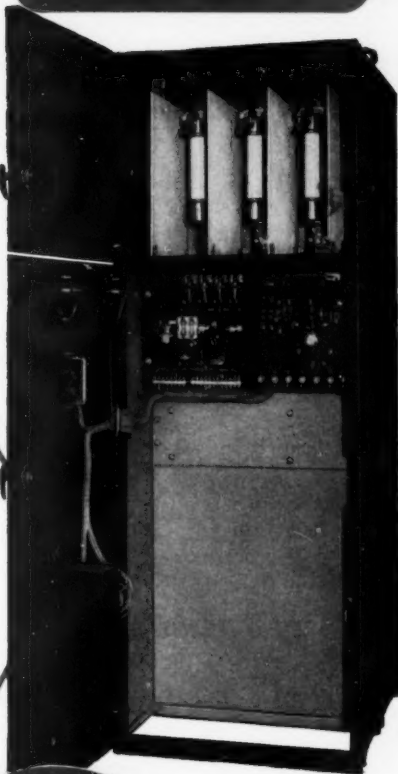
- 1 Short Circuit Protection . . . provided by current limiting fuses that are easily accessible.
- 2 Overload Protection . . . Thermal relays have compensating elements — automatically adjust for ambient temperatures — trip on motor overload only.
- 3 Safe, Accessible Cubicle . . . upper front compartment encloses disconnect type fuses; lower front compartment, the low voltage control devices; rear compartment, the high voltage equipment.
- 4 Easy Installation . . . single steel enclosure is easy to handle, internal wiring is complete, wiring terminals accessible, easy to connect.
- 5 Personnel Protection . . . high voltage fuse compartment has electrical interlock.
- 6 Meters, Push Buttons, Recording Instruments, Rheostats, and similar devices you may need are mounted on the door of the low voltage compartment.

Other features include undervoltage protection . . . and your choice of either air break or oil immersed contactors — whichever is best for your application.

For motor control that is engineered to your job, specify Allis-Chalmers Type H Starters for motors with ratings up to 2500 hp. Call your nearby A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin for bulletin 14B6410A.

ALLIS-CHALMERS Type H Starters

FOR 2500 TO 5000
VOLTS MOTORS



Specify Type 256 Air Break Contactor, shown, for tough, repetitive duty, longer contact life . . . Type MO Oil Immersed Contactor for normal starting duty or for service in dust laden, corrosive or very moist atmospheres.

A-3350

ALLIS-CHALMERS





The Torch of Learning *Flows More Brightly* with **LITECONTROL** Lighting

Geared for learning, planned for seeing... here's a library where high-level visibility goes hand-in-hand with high I.Q.

A custom job? Surely... *in everything but price!*

For LITECONTROL specializes in making a comprehensive line of

standard fixtures for every conceivable requirement... and fitting them to specific applications for the best results.

Thus, with LITECONTROL you get

the right light in the right place with the right appearance... at the least cost.

On your next job, call in your LITECONTROL representative.

See you at Booth 102, Lighting
Exposition, Cleveland Auditorium,
May 6th - 9th.

LITECONTROL *Fixtures*

KEEP UPKEEP DOWN

LITECONTROL CORPORATION, 36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALEERS

*for more efficient,
economical
power distribution*



**POWER
PLUGIN**

For safe, efficient, flexible, economical and dependable power distribution for machines and lights in industrial plants,

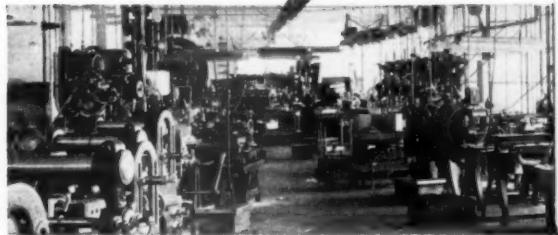
Ⓐ POWERPLUGIN Busduct is unsurpassed.

● Made in standard 10-foot lengths with a plugin outlet every foot of the way in one side, or alternately in two sides, Ⓐ POWER-PLUGIN makes power available where and when it's needed.

● It enables machines to be relocated and regrouped without disrupting production, eliminates temporary connections and long leads, cuts maintenance costs and affords other big savings by reducing power loss and voltage drop to a minimum. Too, it's 100 percent salvageable.

● Underwriters' Laboratories' approved, Ⓐ POWER-PLUGIN is available in capacities of 250 to 1000 amps, 600 volts AC or less with Klampswitchfuz, Shutlbrak or Circuit Breaker plugin units for 200 amps or less.

● If you want greater plant efficiency Ⓐ POWERPLUGIN is the answer. For further information contact your nearest Ⓐ representative, listed in Sweets or write for bulletins.



Features of Ⓐ POWERPLUGIN

Ⓐ POWERPLUGIN is made of 16-gauge steel with attractive gray enamel finish. It is only 7 inches wide, 4 inches deep for 600 amps and less and 6 inches deep for 800 and 1000 amps, permitting its use in restricted areas.

Insulators are one-piece glazed porcelain with steel channel supports riveted into position.

Sliding cover type plugin openings, simplified adjustable, two-screw type fasteners for plugin units, two sliding type mounting brackets per section for hanging as desired, electro-silver plated contact surfaces at joints with two or four brass jam bolts with phosphor bronze cup washers in elongated fastening holes are other features.

Frank Adam Electric Co.

P. O. BOX 357 ST. LOUIS 3, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHEATER





That's All the Cleaning an Allis-Chalmers TEFC Motor Ever Needs

MAINTENANCE COSTS ARE LOW for users of Allis-Chalmers Totally-Enclosed, Fan-Cooled Motors. They are easy to clean because even the stickiest dirt can be wiped or blown off without dismantling the motor or even stopping it. They seldom require cleaning because cooling air flows over the *outside* of the motor. There are no external concealed air passages to clog up and cause over-heating. You get better operational continuity, lower maintenance.

Bearings Save Maintenance, Too

Double-shielded ball bearings require no regular maintenance under most normal operating conditions. Yet if difficult service makes re-lubrication desirable, it can be done without dismantling the motor or bearings. Rigid cast iron frame and stiff end brackets maintain bearing alignment . . . assure maximum bearing life.

Texrope and Vari-Pitch are Allis-Chalmers Trademarks.

ALLIS-CHALMERS



Get The Full Story Now

Your Allis-Chalmers Authorized Dealer or District Office can give you complete information on Allis-Chalmers Totally-Enclosed, Fan-Cooled Motors and how they can save you money. Call one of them today or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.

Sold . . . Applied . . . Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.



PUMPS — Integral motor and coupled types from $\frac{1}{2}$ in. to 72 in. discharge and up.

These conduit problems would have been tough— except for **SEALTITE**



There seem to be few limits to Sealtite's* usefulness. It's used for wiring between moving parts, to absorb vibration, for cramped connections. It protects wiring against oil and grease, moisture, chemicals and impact on machine tools, in processing plants and in temporary installations.

Your electrical supply house carries Sealtite in stock. Or if you would like more information about this versatile, flexible conduit, write to The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.

31226

*Trademark

Today the police car without a radio stands little chance of intercepting the crook. But the radio is in the back; the controls and generator are up in front; and the wiring to connect them must run underneath the car. On this car, operated by a large metropolitan police department, the problem of protecting that wiring from dirt and water, road chemicals and impact is simply solved by running it in Sealtite—the flexible, tough, liquid-tight conduit.

for **flexible, liquid-tight** electrical conduit...specify

SEALTITE

AN ANACONDA® PRODUCT

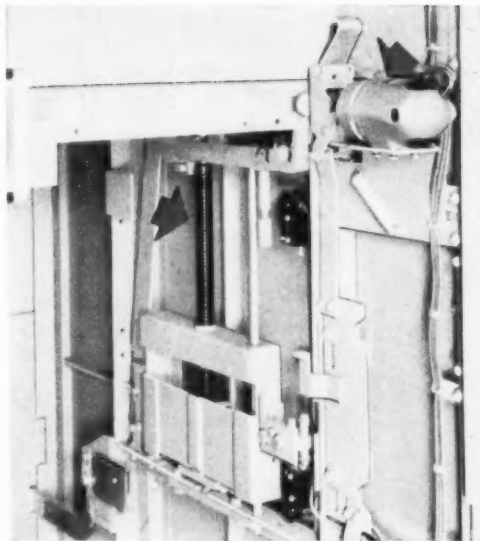


Life in a subway presents some difficulties — and one of them could be the final conduit connector to these fluorescent lighting fixtures in a station on New York's Eighth Avenue Subway line. Sealtite Flexible Conduit makes the installation simple. Its flexibility makes the short radius bend, permits the fixtures to be removed without removing conduit; and Sealtite's tough steel core plus a liquid-tight synthetic jacket protects the wiring against moisture.





REMOVABLE MAGNE-BLAST CIRCUIT BREAKER features improved flame-retardant insulation and simplified contact design. Breaker operating mechanism and control relay are on the front of breaker for easy accessibility.



NEW FASTER ACTING BREAKER ELEVATING MECHANISM can raise the removable circuit breaker into position, or lower it for testing, in 30 seconds. A new compact gear-motor drives the simplified jack screw elevating mechanism.

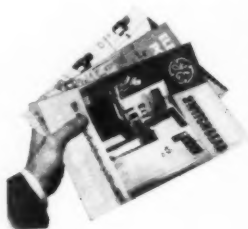
Improved G-E Metal-clad Switchgear

----- STRONGER! SAFER! matched to today's demands for more dependable power for increased production

With fast-moving production schedules calling for more and more electric power, General Electric's improved Metal-clad Switchgear, in 4.16 kv and 13.8 kv ratings, answers the need for even greater power circuit protection and freedom from electrical shut-downs.

Retaining all the basic advantages pioneered in earlier G-E Metal-clad Switchgear and meeting all industry standards, this improved equipment offers a wealth of pace-setting design refinements. New features simplify operation and inspection and provide increased safety for personnel. And with stronger, more rigid construction and simplified design of many components, you get even more dependability.

Look over the typical improvements shown here. Then get the complete story from your local G-E Apparatus Sales Office, or write to General Electric Company, Schenectady 5, N. Y.

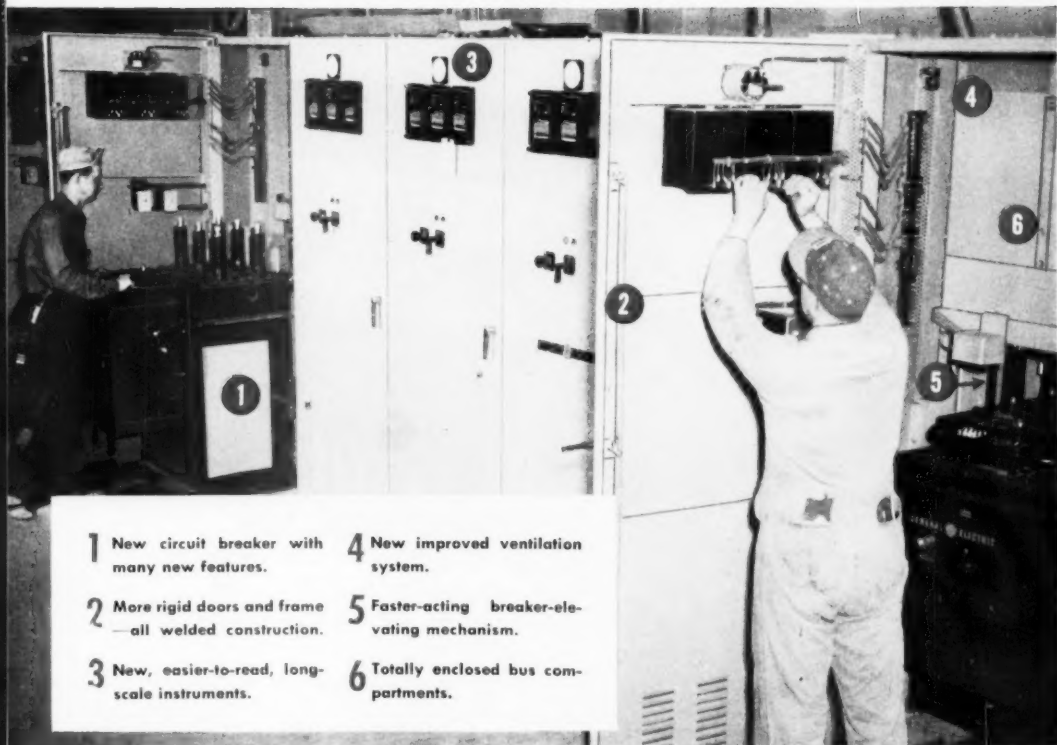


Complete data at your fingertips. Write for these helpful bulletins

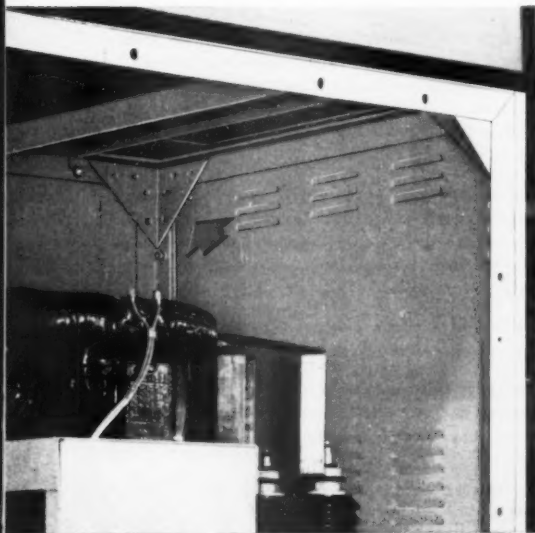
Full information on modernizing or expanding your electrical system with G-E packaged equipment is given in these three illustrated booklets. Write for GEA-5664 "G-E Metal-clad Switchgear," GEA-3592 "Load-center Unit Substations," and GEA-5600 "Power for Industry's Third and Biggest Expansion."

GENERAL  ELECTRIC

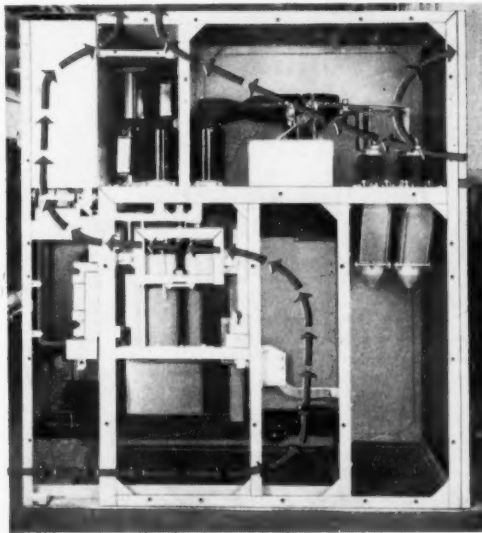
854-45



- | | |
|---|--|
| 1 New circuit breaker with many new features. | 4 New improved ventilation system. |
| 2 More rigid doors and frame—all welded construction. | 5 Faster-acting breaker-elevating mechanism. |
| 3 New, easier-to-read, long-scale instruments. | 6 Totally enclosed bus compartments. |



FRAME NOW COMPLETELY WELDED into one solid unit. Gusseted corners (see arrow) provide greater rigidity. Doors have a three-point latch operated from a single handle, and are reinforced against warping by a steel tube at hinge side.



IMPROVED VENTILATING SYSTEM: Arrows show natural draft of air that constantly ventilates entire switchgear unit. The totally enclosed bus compartment, at upper left, is cooled by circulation of air around it.



Greater Savings

through Simplified Design in Cope Cable Trough Installation



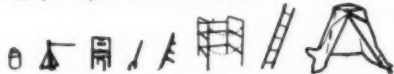
To save material is of the greatest importance to our Defense Effort. We daily read of cuts in allotment of materials for "non-essentials." And when essential equipment—such as Cope Cable Trough—saves material, not only our government but naturally all industry is interested. That's why so much Cope Cable Trough is being used by outstanding Utilities, Industrial plants and Government agencies.

By using standard Cope Cable Trough and Fittings—turns, branches, reductions, vertical as well as horizontal runs that can be so easily assembled—waste of materials during installation in the field are eliminated. For the same reasons, countless man-hours are saved in installation time.

If unusual problems of installation arise, the Cope Engineering Staff is at the service of customers to help design special fittings.

Since it is the duty of everyone to conserve—and since Cope Cable Trough saves material, labor and costs—you will want a copy of our latest Bulletin describing Cope Cable Trough. Won't you write for it today?

You know Cope by these Products . . .



T. J. COPE, INC., 711 SOUTH 50th ST., PHILADELPHIA 43, PENNSYLVANIA

GET *Low Cost* LOAD CHECK WITH THE NEW

**Thermalite
OVERLOAD INDICATOR**

LOOKING FOR AN INEXPENSIVE, practical way to load survey your distribution system? Why not investigate the advantages of the new *Thermalite* overload indicator now available in Allis-Chalmers transformers. This simple, reliable device will:

1. Offer a continuous visual load check that may be conducted from your service truck.
2. Locate transformers carrying high loads; eliminate extensive and costly area surveys.
3. Provide a visual check on transformers in hard-to-get-at locations.

Thermalite overload indicator lights up brilliantly in response to high oil temperatures — and remains lighted during the overloaded conditions until reset manually with the convenient reset handle. Though the signal device locates overloaded transformers visually, it *does not interrupt service*. It's quiet in operation, low in cost . . . and is engineered, calibrated and installed in the transformer at the factory.

You'll find that the *Thermalite* overload indicator will offer economies never before possible. You will be able to keep more up-to-date records on transformer performance — permitting you to schedule transformer replacements or load rearrangements during daylight hours. It will help to eliminate emergency service interruptions, costly maintenance and possible burnouts.

Thermalite is an Allis-Chalmers trademark.

ALLIS-CHALMERS



For more facts and a demonstration of its operating principle, call your nearby Allis-Chalmers district office. Or write to Allis-Chalmers, Milwaukee 1, Wisconsin.

Allis-Chalmers
Milwaukee 1, Wisconsin

Please send me:

- ☐ Technical Sheet No. 57764
☐ Reprint of article "Heavier Transformer Loading Is Feasible."

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TESTING TIPS

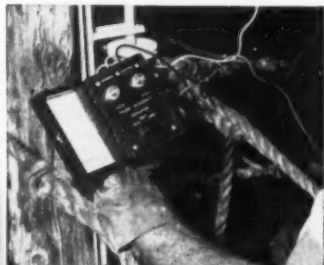
for the maintenance
of plant equipment



CF-1 INKLESS RECORDER

Accuracy: $\pm 2\%$ full scale
No ink to freeze or evaporate. Available for either a-c or d-c operation, with charts lasting up to 30 days.

PRICES START AT—\$107.47*

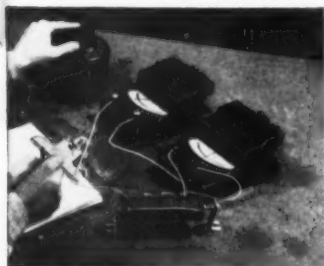


PHASE SEQUENCE INDICATORS

Rating: 120/240/480 volts or 120/240/600 volts

Pocket-sized device for phase sequence of polyphase circuits. Just connect 3 leads to read.

PRICES—\$28.14 or \$31.77*



HIGH ACCURACY PORTABLES

Accuracy: $\frac{1}{4}$ of 1% full scale for AP-9 (a-c)
 $\frac{1}{2}$ of 1% full scale for DP-9 (d-c)

Compact, small portables for precision measurements. Available in either a-c or d-c models.

PRICES START AT—\$42.01*

L & P Electric Co. Cuts Testing Time 75% With Complete Line of G-E Instruments



Motor repair work simplified by three hook-on instruments

L & P Electric Co. of Brooklyn, N. Y., an authorized G-E agent and distributor, has a large service shop where it does extensive repair and reserve work on motors and their associated equipment. Mr. L. Lidsky, President of L & P, reports, "We have been able to cut our testing time by 75% by using G-E hook-on instruments to locate the faults in motors that are brought to us for repair. Our complete line of six G-E testing instruments (the AK-1, AK-2, AK-3, phase sequence indicator, CF-1 recording voltmeter, and Type AP-9 DP-9 portables) has enabled us to reduce our maintenance costs by 25%.

AK-1 VOLT-AMMETER

Handy-portable instrument measures both volts and amperes over a range of 15-600 amperes, and 100-600 volts. It maintains an accuracy of ± 3 per cent full scale. It's used primarily for motor checks of polyphase circuits. Price—\$76.77*.

AK-2 WATTMETER

The AK-2 measures a-c power easily. Both single and polyphase circuits can be analyzed; in addition to kilowatts it will measure vars in balanced three-phase circuits. It will measure up to

300 KW, 15-600 amperes, and 100-600 volts with a full-scale accuracy of ± 5 per cent. Price—\$87.00*.

AK-3 POWER FACTOR METER

Accurate to within 0.05 PF, the AK-3 power-factor meter can be used on any balanced 3 phase circuit. It reads power factor directly in the circuit. When making capacitor surveys,

if your power factor is now	you can re- lease this much extra capacity	with this many capacitors for each 100 kw of load
65%	34%	84 kvar
70%	29%	69 kvar
75%	23%	55 kvar
80%	17%	42 kvar
85%	11%	29 kvar
90%	5%	15 kvar

(Power factor is raised to 95%. New load is at original power factor.)

you'll find the AK-3 a valuable time saver. The table above shows what you can expect from adding capacitors to your feeder lines. The AK-3 is rated 100-600 volts and 15-600 amperes. Price—\$87.00*.

602-216

*Manufacturer's suggested price.

GENERAL  ELECTRIC

BUY NOW

**From Your Nearest
G-E Distributor**



**preferred for
power tools...**

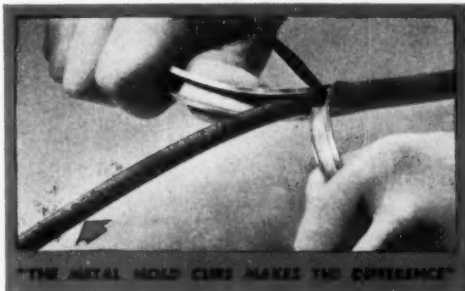
mold-cured HAZACORDS® give better service...longer life

Fewer replacements...less time lost...lower operating costs—that's what using Hazacord means to you. Regardless of the treatment it gets, mold-cured Hazacord has the "built-in" ability to absorb more punishment and stay on the job longer—that's why it's preferred for economical service on rugged industrial jobs everywhere.

Every Hazacord flexible cord and portable cable is protected with Hazard's exclusive Hazaprene ZBF sheath which means extra resistance to such common industrial perils as oils, acids, chemicals, moisture and weather. In addition, the Hazaprene sheath is *cured under pressure in a continuous metal mold*—the best method known to provide extra density, lasting toughness, a smooth, abrasion-resistant surface. And its high flame resistance more than meets the requirements of the Federal Bureau of Mines and the Pennsylvania Department of Mines.

There's a Hazacord flexible cord or portable cable for

every need. Ask your jobber about Hazacords today. For the complete catalog of Hazacord flexible cords and portable cables **EC-420** write to Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.



Feel the embossed name Hazacord on the sheath — positive proof of a mold-cured cord. And mold-curing means extra long life to portable cords.

HAZARD

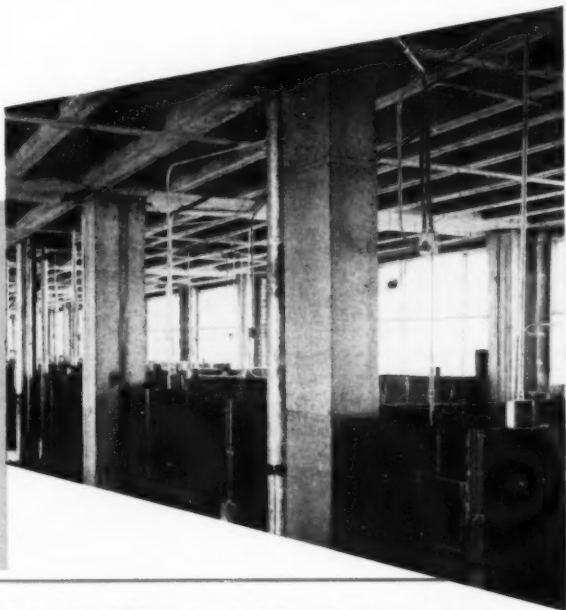
insulated wires and cables for every electrical use





Hospital Service that is Ever Ready

For all types of circuits in
all types of construction,
ELECTRUNITE E.M.T. pro-
vides maximum protec-
tion, helps keep construc-
tion on schedule.



REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION
224 EAST 131st ST. • CLEVELAND 8, OHIO



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Grosse Pointe, Michigan
Charles Sullivan Association
Architects
Snyder & McLean
Engineers
Hydon-Brand Electric Company
Electrical Contractors
O. W. Burke Company
General Contractors

... relies on protective ELECTRUNIT E.M.T.

Lighting and communications circuits in this new hospital are steel-protected from fire, moisture, and mechanical damage by Republic ELECTRUNIT E.M.T. (Electrical Metallic Tubing).

This light-and-strong steel raceway is easily installed in all types of buildings . . . for new jobs or relocation of facilities in older buildings. It is inspected by Underwriter's Laboratories and approved by the National Electrical code for concealed, exposed, and concrete installations.

Exclusive "Inch-marked®" lengths and uniform ductility help electricians make smooth, accurate bends. Exclusive inside knurling greatly reduces the job of pulling wires. Compression fittings eliminate threading and permit tight assembly without turning the whole run.

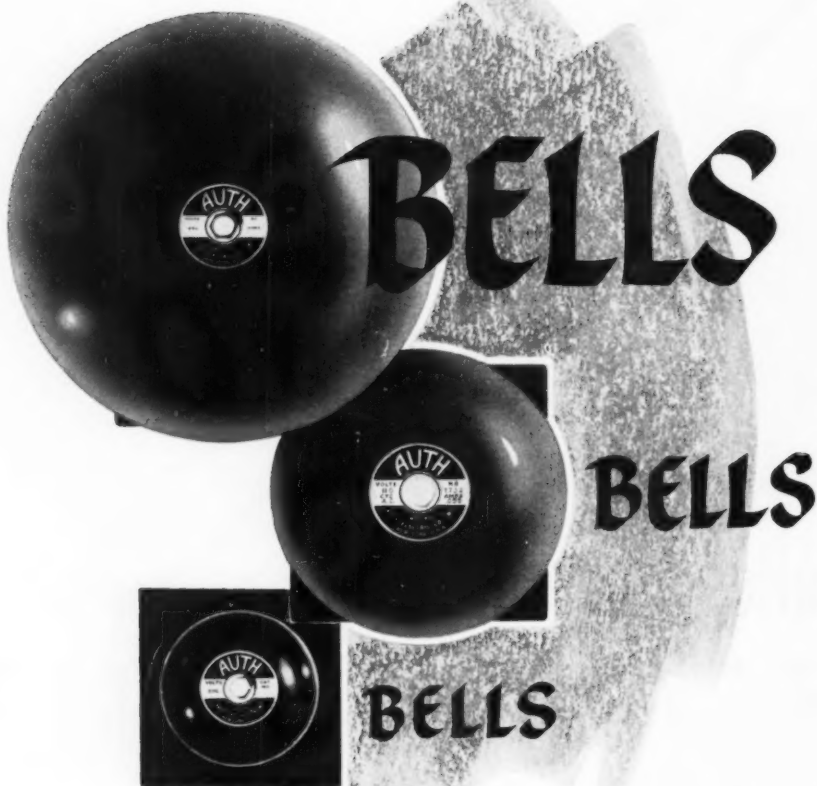
★ ★ ★

Where *extra-severe* corrosion is encountered, consider ELECTRUNIT "Dekorion-Coated" E.M.T. . . . the plastic-armored raceway that is tougher even than severest chemical atmospheres.



Republic
ELECTRUNIT E.M.T.

LIGHTWEIGHT THREADLESS RIGID STEEL RACEWAY



BELLS . . . for all heavy duty signaling and alarm purposes . . . unsurpassed for volume of sound, ease of installation, long life and clean design.

AUTH POWERBELLS are made in gong diameter sizes of 4 inches, 6 inches and 10 inches. They are supplied in vibrating and single stroke models, for alternating or direct current operation on voltages up to 250 volts. All model sizes are equipped with interchangeable back plates and separable connection feature. They are designed to fit all mountings, and are gasket sealed against dust and moisture.

AUTH POWERBELLS represent the latest advances in bell design and provide the most complete line of heavy duty bells available today.

MANUFACTURERS OF
Electrical Signaling,
Communication and
Protective Equipment for
Housing, Hospitals,
Schools, Offices, Ships,
and Industry.



Write now for FREE complete literature.

COMPLETE SYSTEMS ONE RESPONSIBILITY

AUTH ELECTRIC COMPANY, INC.

34-20 45th St., Long Island City 1, N.Y.

THE MOST COMPLETE LINE OF RECEPTACLES AND PLUGS

R&S design and precision manufacture meets and exceeds Underwriters' Laboratories and NEMA requirements.



R&S manufactures the most complete line of quality plugs, receptacles and connectors ever made available to industry!

Types, sizes and assembly combinations for waterproof, weathertight and explosion-proof applications are made in almost endless variety, for standard or reverse service.

Capacities range widely from 10 to 400 amperes.

Polarized plugs cannot be inserted incorrectly.

Sealed cable grip excludes all dust and moisture.

Ample wiring space facilitates servicing and inspection.

WRITE FOR CATALOG NO. 9048-4.

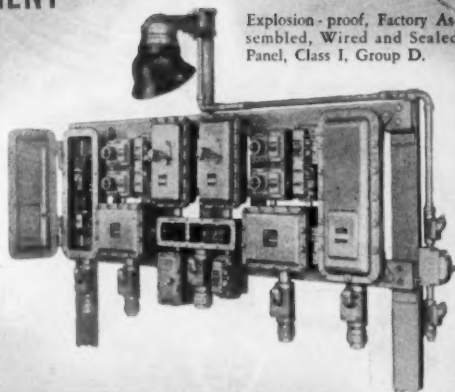
2 OUTSTANDING R&S PRODUCT LINES

R&S EXPLOSION-PROOF EQUIPMENT

The wide variety of R&S explosion-proof equipment includes many standard enclosures—compact units possessing a high degree of flexibility and "packaged" safety. Circuit Breakers, EFS Switches, Push Buttons, Pilot Lights, Motor Starters, Combinations and individual Panels up to 32 circuits . . . all have slide operating mechanisms, removable front covers, abundant wiring space and conduit outlets . . . along with individual features that meet all standards, *plus!*

R & S custom-built panelboards composed of standard enclosures factory assembled, sealed and tested, offer obvious advantages over special designs and field assemblies.

WRITE FOR CATALOG H-47-4



Explosion-proof, Factory Assembled, Wired and Sealed Panel, Class I, Group D.

RUSSELL & STOLL COMPANY, INC. • 125 BARCLAY STREET, NEW YORK 7, N. Y.



RUSSELL & STOLL

PRECISION-BUILT ELECTRICAL EQUIPMENT—SINCE 1902

THE TWO E·M·T FITTINGS

THAT ARE EASIER TO USE—
SAVE MONEY TOO!




Cross Section
Showing
Indentations.

Easier to use and neater in appearance, Briegel All-Steel Indenter Fittings not only make stronger connections but also make each job more profitable. Contractors the world over recognize their cost cutting qualities and the fact that they make each wiring job a better job. It is only natural that Briegel Fittings are the most widely used E.M.T. connectors and couplings.

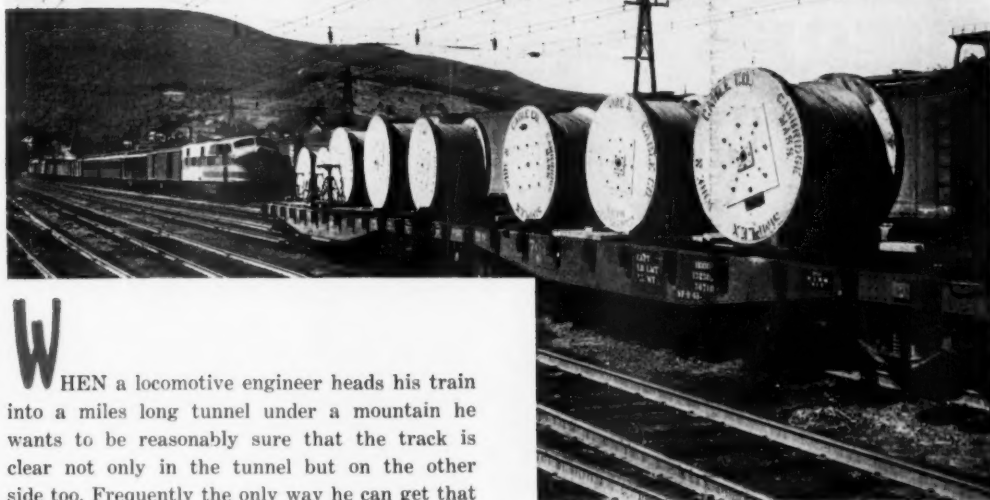


BRIEGEL **METHOD**
TOOL
CO.
GALVA, * ILLINOIS

Distributed by

The M. & Austin Co., Northbrook, Ill.; Clayton Mark & Co., Evanston, Ill.; Clifton Conduit Co., Jersey City, N. J.; General Electric Co., Bridgeport Conn.; The Steelduct Co., Youngstown, Ohio; Enameled Metals, Pittsburgh, Penn.; Wagner Malleable Products Co., Decatur, Ill.; Kandu Mfg. Co. Ltd., Preston, Ont.

"What's Cookin'" on the other side of the mountain?



WHEN a locomotive engineer heads his train into a miles long tunnel under a mountain he wants to be reasonably sure that the track is clear not only in the tunnel but on the other side too. Frequently the only way he can get that information is through signal systems. When they are sitting on a siding signal cables may not look like much but once they are installed and connected they are a most important piece of equipment to a locomotive engineer.

Railroad Signal Cables carry a heavy burden of responsibility for the safety of passing trains. For that reason Railroad Signal Engineers are more often than not apt to be very "choosy" about the kind of signaling equipment they buy

and install. More and more these days you will see Simplex-ANHYDREX Signal Cables like these being installed by railroads all over this country.

These cables are installed underground and overhead, in tunnels or in bright burning desert sunlight, on signal bridges across busy terminal tracks or buried in the slime and mud of swampy land. Why this trend to ANHYDREX Signal Cables? Because they are dependable. Regardless of the operating conditions if they are properly installed ANHYDREX Signal Cables will operate dependably year in and year out.

If you have a power, signal or control cable problem we will be glad to discuss it with you and make recommendations based on nearly seventy years experience.

SIMPLEX-ANHYDREX

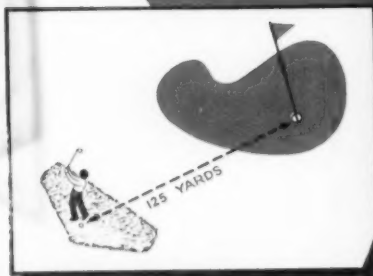


SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

**EXPERTS AT WORK,
EXPERTS AT PLAY,
ALL AGREE:**

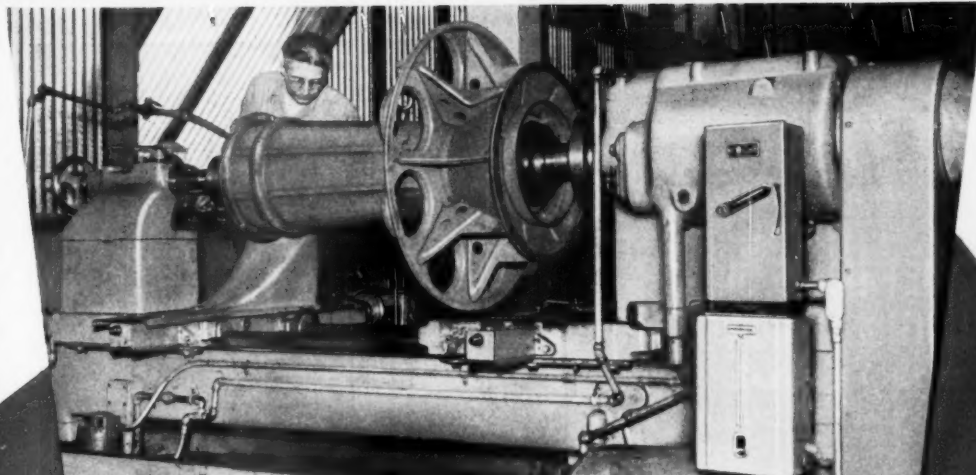
THERE'S ONE BEST WAY!

Trapped! Your last shot lands you right in the middle of a sand trap 125 yards from the green. You have to shoot from a half-buried lie. What would you do?



Golf experts agree the best way to get out of trouble is to play the half-buried ball with a sand iron, using an explosion shot. The clubhead is swung into the sand about an inch to an inch and a half behind the ball, blasting the ball out of the trap... placing you in good position to play for the green on the next shot.

Electrical experts agree the best way to keep your power, lighting, and distribution circuits out of trouble is to protect them with circuit breakers. But selection of the correct circuit breaker for the task is the important decision.



Expensive electric motors demand *special* protection against sudden short circuits as well as the overload protection furnished by motor starters. The best way to guard capital equipment against costly damage is to install dependable I-T-E circuit breakers. They are precisely calibrated and pretested to trip *instantaneously* upon short circuit, with all poles opening simultaneously. Quick restoration of service is obtained by resetting and closing the operating handle.

When it comes to circuit breakers, experts agree, your best choice is I-T-E. And the best way to choose the right I-T-E breaker is to use our new *Bulletin 5108-D*. Prepared by circuit breaker specialists, this bulletin completely describes the full line of I-T-E Molded Case Circuit Breakers—gives you six pages of tables plus selection and application data. You can easily find your correct circuit breaker ratings—and the circuit breaker to fit your particular shop conditions.

Whichever I-T-E breaker you select, you'll be doubly right. I-T-E gives you more than minimum protection. You get that all-important *reserve* protection as well. Every I-T-E breaker has reserve thermal and mechanical capacity far beyond its requirements. Every I-T-E breaker is made to carry full rated load indefinitely.

So get the best. Specify I-T-E. Available in four frame sizes covering:

10 to 600 amperes • 120 to 600 volts a-c • 125 to 250 volts d-c



REMEMBER—get your copy of Bulletin 5108-D from your local I-T-E distributor...or write I-T-E Circuit Breaker Company, Philadelphia 30, Pa.

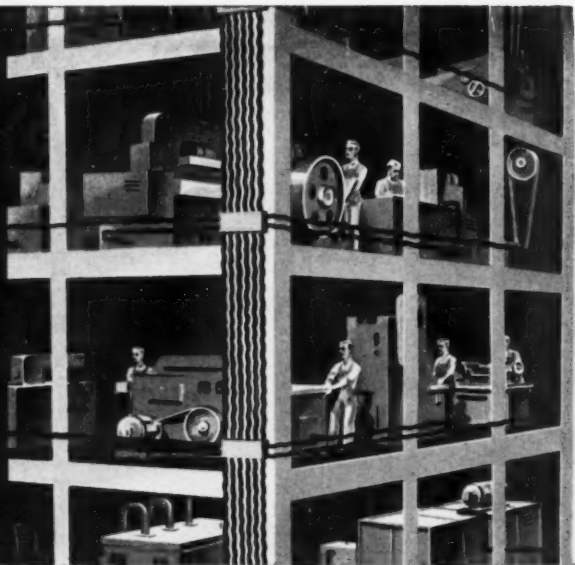


MOLDED CASE CIRCUIT BREAKERS

I-T-E CIRCUIT BREAKER CO. • 19th and HAMILTON STS. • PHILADELPHIA 30, PA.

Canadian Mfg. & Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., N.Y. 17, N.Y.

NEED NEW LIFE
IN YOUR
UNDER-POWERED
BUILDING?
**GET UP TO 50%
ADDITIONAL POWER**
WITHOUT REPLACING
PRESENT CONDUIT
WITH
ROCKBESTOS A.V.C.®



Here's How You Benefit

Use Same Size Cable . . . get $\frac{1}{2}$ to $\frac{1}{2}$ more current.

Use Present Conduit and Fittings . . . save on steel.

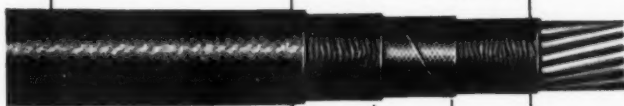
Installation Costs Are Low . . . cable size remains the same, is easy to pull through conduit. Using present conduit eliminates costly installation.

No Building Repairs . . . because you use existing conduit, there are no walls to repair, no weakened beams or partitions to repair.

A Time Saver . . . Old buildings or new, Rockbestos A.V.C. is a dollar-saver, and time-saver. Write for booklet "Rx for a Building with Hardening of the Electrical Arteries."

Have electrical loads outgrown your power requirements? You can increase your capacity up to 50% by merely replacing the present cable with Rockbestos A.V.C. . . . *the cable with the higher ampere rating.*

IT'S THE **A.V.C.** "SANDWICH"
THAT MAKES THE DIFFERENCE



This "sandwich" protects the varnish cambric. It enables A.V.C. to carry more current than cables with conventional insulations.

Inner
Felted
Asbestos
Wall

Varnished
Cambric

Outer
Felted
Asbestos
Wall

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONN. • the originators of **A. V. C.®**
New York • Cleveland • Detroit • Chicago • Pittsburgh • St. Louis
New Orleans • Los Angeles • Seattle • Oakland, California



...Your best buy

The Protection of *Century*

Type TEFC* Motors

Keeps Production Rolling



Total Enclosed Fan Cooled Motors*

- Smooth exterior surface—easy to clean
- Cast iron frame resists rust and corrosion
- Rugged construction—safety factor for tough handling
- Integral cast feet mount securely when attached to flat plates where protruding material may interfere

Your Maintenance Man...

who must keep your Production Turning, knows how to evaluate the inside of the Motor. Ask him about these Century Construction features.

Century Type TEFC protected type motors are very popular in the chemical and food processing industries for resisting rust and corrosive fumes. They are widely used in the metal working industries to protect the vital parts against abrasive dust or gritty oil fog.

Specify Century motors on the motorized equipment you purchase, or call a Century branch office or a Century distributor when you purchase motors. Century manufactures a complete line from 1/2 to 400 H. P.



- Vital parts of motor protected — sealed-in inner frame.
- Reverse direction of motor without changing fan — Fan runs in either direction.



- Uniform ventilation — surrounding outside of inner frame.
- Smooth straight-through ventilating passages.
- Winding electrically insulated 6 different ways.



- Uniform rotor winding — high pressure cast aluminum.
- Ball bearing housing keeps grease "in" — dirt "out" — lubricated for several years' normal service, with grease plugs when you want to lubricate bearings.



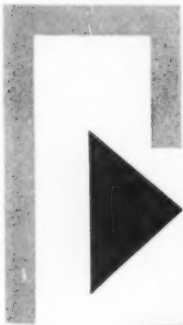
- Easy to remove fan guard for inspection — 2 screws hold steel fan guard in place.




CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities



*as fundamental as
interior trim...*



*No electrical
contract is complete
unless it contains
provisions for
telephone raceways.*

Interior details are often the most important details to home owners. And one they'll rate high is concealed telephone wiring. Raceways, built into the walls during construction, will help protect the beauty of carefully finished walls and woodwork. Equally important, they'll mean extra profits for you. It's good business—and a profitable practice—to make built-in telephone facilities a part of every home wiring job.

BELL TELEPHONE SYSTEM

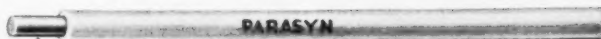


IF IT'S PARANITE IT'S ^{the} RIGHT ^{Wire and Cable}

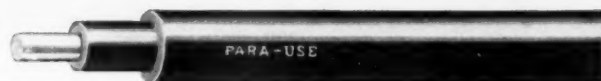
PARAFLEX Non-Metallic Sheathed Cable lays flat. Won't squirm or twist. Clean to handle. Plainly marked.



PARASYN Type TW Thermoplastic Wire stands exposure too severe for rubber insulated wires. Smaller diameter.



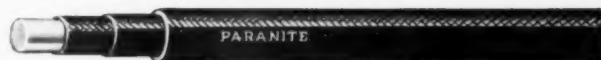
PARA-USE Type "RR" Cable provides permanent underground installation from power line to meter, and for connecting several buildings. Meets requirements of CAA Specifications L-824 as Type A (on all applicable sizes).



HYDRO-THERM Building Wire combines in a single wire the heat-resistant qualities of Type RH and the moisture resistant qualities of Type RW.



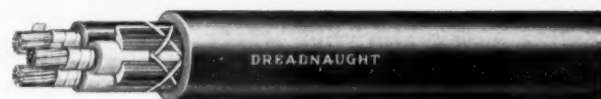
URC Weatherproof Wire and Cable can be relied upon to meet severe climatic conditions. Both actual line and Weather-Ometer tests prove unusual ageing characteristics.



SERVICE ENTRANCE CABLE, Type SE Style U unarmoured and Type SE Style A armoured. There is also a Parinite Service Drop Cable, two conductor, Type SD.



DREADNAUGHT Heavy Duty Cable has lead-cured neoprene insulation. Flexible, durable, safe, long-lived. Cuts repairs and replacements. Delivers current continuously.



IF IT'S **PARANITE** IT'S RIGHT!

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THROUGH
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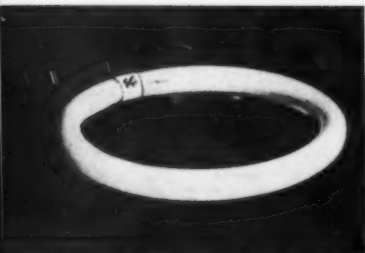
PARANITE WIRE AND CABLE
Division of **ESSEX WIRE CORPORATION**
FORT WAYNE 6, INDIANA

WIRES
AND CABLES
SINCE 1890

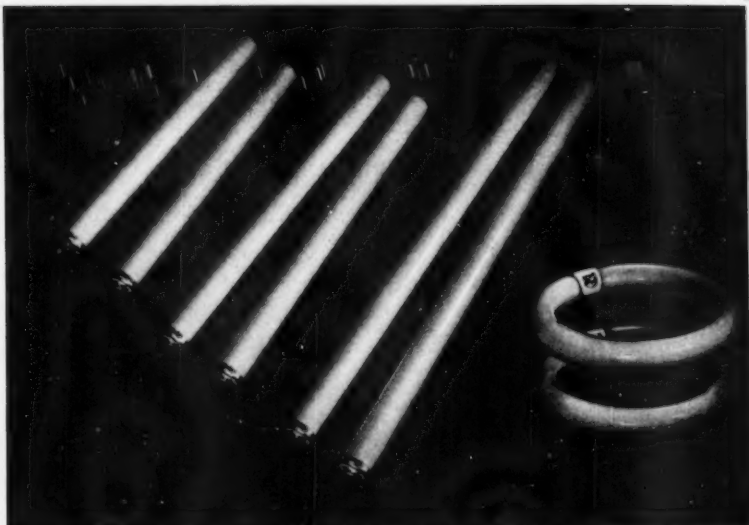
WAREHOUSES AND SALES OFFICES: Atlanta, Ga.; Boston, Mass.; Chicago, Ill.; Cleveland, Ohio; Dallas, Texas; Detroit, Mich.; Indianapolis, Ind.; Kansas City, Mo.; New York, N.Y.; Philadelphia, Pa.; St. Louis, Mo.; St. Paul, Minn.; Toledo, Ohio; Washington, D.C.; Wichita, Kan.

EXPORT SALES OFFICE—LIONEL-ESSEX INTERNATIONAL CORPORATION, 15 E. 24th ST., NEW YORK 10, N.Y.

ELECTRICAL WIRES AND CABLES "BETTER THAN CODE REQUIRES"



G-E ballast No. 89G332 for 32-w Circline lamp.



NEW: Ballast 89G322 for 22-w Circline lamp.

JUST ONE G-E ballast (89G331) operates two 14, 15, or 20-w lamps, or two 22-w Circline lamps.

More fixture designs possible

Now—make residential fixtures with all the above lamps and combinations — without using starters!

For the first time you can make fixtures using all of the above lamps and lamp combinations—*without using external starters*—with General Electric's expanded line of Trigger-Start Ballasts!

EXPAND YOUR MARKET

Your fluorescent fixtures will sell easier and faster because of the great customer appeal of G-E Trigger-Start Ballasts. They start lamps instantly without flickering, and they remove the bother of replacing worn-out starters. Moreover, these ballasts conserve lamp life because of their unique operation: electrodes are immediately pre-heated

at the flick of the switch, then starting current drops to practically zero when the lamp goes on—almost faster than the eye can see!

REDUCE STOCK PROBLEMS

Note that only five different G-E Trigger-Start Ballasts are needed to operate all of the above lamps and combinations. And, of course, there's no need to stock starters for trigger-start ballasts.

For more information on G-E Trigger-Start Ballasts contact your local G-E Sales Office, or write *Section 412-98, General Electric Co., Schenectady 5, New York.*

GENERAL  **ELECTRIC**

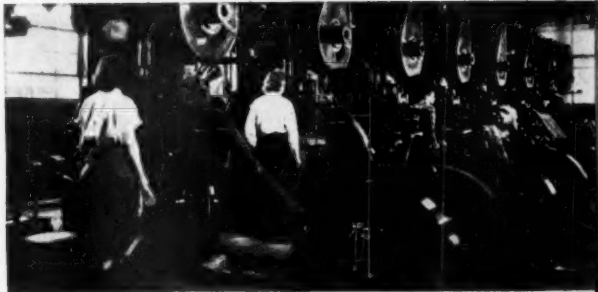


ONE G-E ballast (89G320) for 14, 15, or 20-w lamps. **NEW:** G-E ballast 89G333 for one 12-inch and one 8 1/2-inch, or two 12-inch Circline lamps.

with G-E Trigger-Start Ballasts



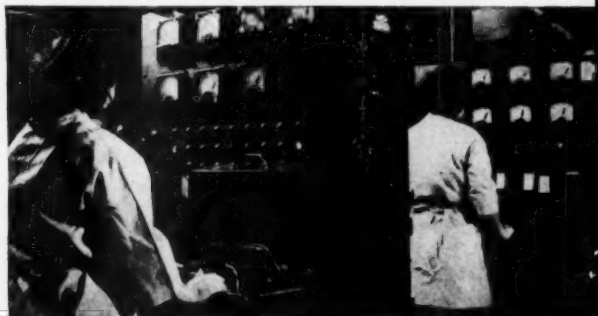
BETTER BALLASTS to help you build your fluorescent trade are continually being developed by G-E.—world's largest producer of ballasts. Above, G-E engineers work out new ballast design.



MORE BALLASTS AT LOWER COST are made possible by G-E standardization and mass-production methods. Above are automatic punch presses for cutting core laminations in G-E Danville (Ill.) Plant.

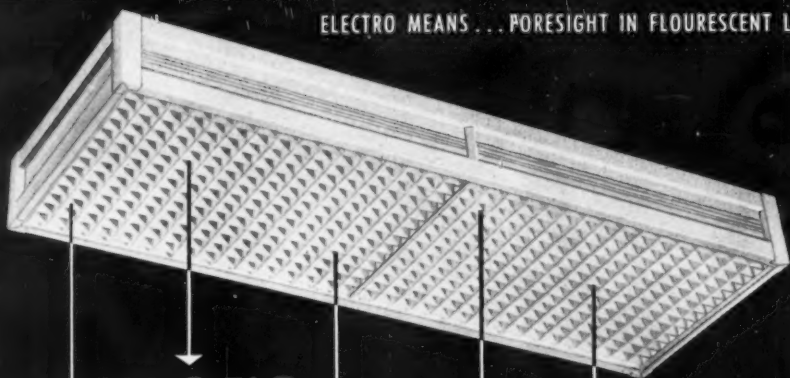


TOP PERFORMANCE is the result of continuing study of fixture manufacturers' problems and actual ballast operation.



YOUR ASSURANCE of a good ballast every time you buy G-E is automatic testing apparatus on the production line.

ELECTRO MEANS... PORESIGHT IN FLOURESCENT LIGHT



more
downlight!

New! Exclusive "Spring-a-matic" Louver Action

Another ELECTRO advancement!

The easiest, safest, fastest device for opening and closing louvers ever developed. Two hidden springs hold "Surf-A-Lite" louver firmly in place. No screws, bolts or other mechanical gadgets to work loose, drop out or get out of order.



JUST PRESS—and
louver opens for clean-
ing or relamping



LIFT—and entire
louver comes right
out



**LIGHT PRESSURE UP-
WARDS**—and springs
lock louver into posi-
tion firmly and securely.

New ELECTRO "Surf-A-Lite" with Styrene louvers

Now—the smart, neat appearance of a surface mounted fluorescent fixture—and greater lighting efficiency as well! The new, shallow "Surf-A-Lite" incorporates ELECTRO'S improved plastic louvers and a metal reflector plate to utilize more downlight... achieve better general diffusion... give increased lighting efficiency overall.

Wherever specifications indicate the desirability of a flush mounted fluorescent luminaire, select the more attractive appearance and superior lighting ability of the new ELECTRO "Surf-A-Lite".

- Lustrex styrene plastic louvers are guaranteed not to warp or discolor under normal use for the life of the fixture.
- The "Surf-A-Lite" can be used for pendant mounting as well as surface mounting by easy removal of reflector plates.
- "Surf-A-Lite" hugs the ceiling for that recessed "look"... helps end "ceiling clutter".
- No visible screws, hinges or other metal devices.
- Side Panels available in metal or in translucent Lustrex styrene plastic.
- Improved 45°—37° Shielding.
- For individual or continuous mounting.
- In 4 lamp and 2 lamp, 40 and 20 watt models.
- Also in 4-6-8 ft. SLIMLINE.

AVAILABLE THROUGH LEADING ELECTRICAL WHOLESALEERS EVERYWHERE



ELECTRO MANUFACTURING CORPORATION

2000 W. FULTON ST. • CHICAGO 12, ILLINOIS

Some Things Are WORSE THAN STRIKES

This editorial which appears in McGraw-Hill publications was written just prior to the resignation of Charles E. Wilson as Director of Mobilization. The principle it discusses is of basic and continuing importance in our struggle to maintain economic and personal freedom in America.

It is to be hoped that the managements of the steel industry will resolutely resist the efforts of the national Wage Stabilization Board to force them to establish the union shop in their plants. In essence, the union shop means compulsory union membership.

They should resist not because of any financial advantage to the owners of the industry. There would be none. They should resist out of a decent regard for those ideals of our country which we are now fighting in Korea to protect. Moreover, their resistance would, as a matter of fact, benefit the leaders of the organized steel workers by protecting them from the certain and bitter fruits of their "victory" in getting the government to impose the union shop on the steel industry. Their successful resistance would also prevent Premier Stalin and his co-workers from enjoying a hearty laugh at our expense.

Fun for the Russians

This is why the Politburo would find the establishment of the union shop in the steel industry, at the behest of the Wage Stabilization Board, so profoundly amusing. We are fighting in Korea because we believe that armed aggression, promoted by Russia, menaces our freedom. And we are spending hun-

dreds of billions of dollars here at home for armament to protect our freedom at other danger points. When this rearmament program is threatened by a crippling strike, the federal government through its Wage Stabilization Board proposes to buy off the threat by plowing under a vital element of that freedom which we are trying so desperately to preserve.

When the union shop is adopted through voluntary agreement, as it has been in cases covering millions of workers, it deeply undercuts the freedom of the individual. To hold his job he is required to join the union and support it financially whether he wants to or not. In the case of such voluntary agreement, however, the government takes no direct part in thus destroying the freedom of its citizens. It is essentially a private transaction.

Tyranny is the Word

But in the steel case the federal government becomes a party to a direct attempt to impose the union shop. Instead of protecting its citizens in their right to earn a livelihood, the government forces certain of them to join and support a private organization which they have clearly indicated they do not want to join. This they must do to hold their jobs. Tyranny is the accepted designation of government coercion of this kind.

It may be objected that the Wage Stabilization Board merely recommends the union shop, does not order it. This was also true of the action recently taken by a President's Emergency Board, which also "recommended" that working agreements between the

railroads and about a million non-operating railroad employees include a provision for the union shop. A government recommendation, however, can easily be given much of the force of an order, particularly by the calling of a strike to "uphold the hand of the government."

It seems entirely clear that in trying to impose the union shop on the steel industry the Wage Stabilization Board has completely lost its bearings. It was set up to handle labor problems to tide over an emergency. Now it comes up with a revolutionary modification of labor relations in the steel industry which, if adopted, would become a permanent part of the institutional machinery of the industry.

"Too Much Like Hitler"

Early in World War II an effort was made to have the federal government order the union shop for a group of organized coal miners. President Franklin D. Roosevelt, who will go down in history as one of organized labor's greatest champions, blocked it. "That," he said, "would be too much like the Hitler methods toward labor." But now, with supreme irony, the federal government fosters this Hitlerlike method toward labor ostensibly to advance our conflict with Stalin.

In persuading the Wage Stabilization Board to sponsor the union shop for steel workers, there is every reason to believe that the union leaders have trapped themselves. If the government imposes the union shop, a next step clearly becomes necessary. This is government regulation of the union in order to provide a modicum of protection for the minority that would be forced by the government to join against their will. It could be that for a time the government would ignore this obligation. But, having granted the union the power to eliminate the minority, it would sooner or later be forced to regulate the use of that power. Thus free collective bargaining and freedom itself would be the losers.

An Issue of Basic Principle

Resistance to a government-sponsored union shop for the steel industry is bound to bring harsh denunciation both from the administration and union leaders who have teamed to back it. Not only does the union shop relieve the union leaders of the problem of recruiting members, it also eliminates a group of workers that they stigmatize as "free riders"—namely, those who work for companies which have a working agreement with a union but do not join the union. In the basic steel industry about 10 per cent of those who work for companies with union agreements are not members of the union. Such a small percentage of non-members is obviously no threat to the "security" of the union, although that is what the drive for the union shop ostensibly is designed to protect.

In the reporting of the present labor dispute in the steel industry virtually all of the attention has been focussed on the handling of the issue of a wage increase and how large it should be. This, to be sure, is vitally important. Mobilization Director Wilson has said it is "a serious threat to our year-old effort to stabilize the economy." But certainly of comparable importance is the tremendous issue of principle raised by the government's backing of the union shop for the steel industry.

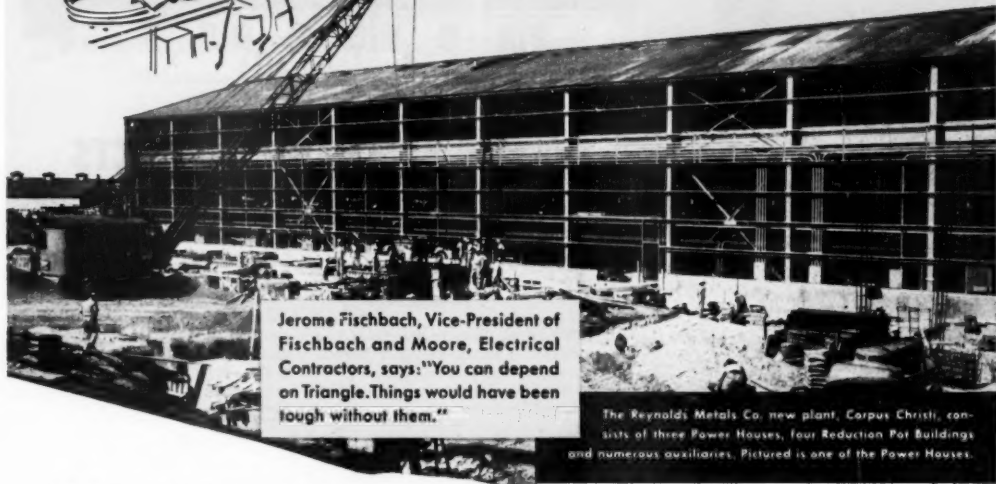
If the position of the Wage Stabilization Board on the union shop prevails, our government will have blunted the arms we are forging to fight for our freedom abroad by undermining a major bulwark of our freedom right here at home. At this critical time in the struggle to preserve and protect our freedom such a subversive course should be resisted to the limit.

McGraw-Hill Publishing Company, Inc.

FROM A FEW FEET OF CABLE

TO MONUMENTAL JOBS—

YOU CAN DEPEND ON TRIANGLE



Jerome Fischbach, Vice-President of Fischbach and Moore, Electrical Contractors, says: "You can depend on Triangle. Things would have been tough without them."

The Reynolds Metals Co. new plant, Corpus Christi, consists of three Power Houses, four Reduction Pot Buildings and numerous auxiliaries. Pictured is one of the Power Houses.

Whether you buy cable and conduit over the distributor's counter or order material in car load lots—you can depend on Triangle. You can depend on Triangle from two very important angles—**quality and service.**

Take the monumental job pictured. It's the new Reynolds Metals Company plant being erected in Corpus Christi, Texas, for the manufacture of aluminum Pigs and Ingots. Its completion in a hurry is important to our defense program. The Electrical Contractor, Fischbach and Moore Inc., New York, had 1000 men working on the project at its peak! Over 1½ million feet of wire and 420 tons of conduit were used! Of those amounts, Triangle furnished over 60%.

ON SCHEDULE—that's what counted on this important job! Jerome Fischbach, Vice-President of Fischbach and Moore has this to say about Triangle's dependability. "Triangle came through on schedule right down the line. Believe me, things would have been tough without them and that goes for all the other jobs they've helped us on."

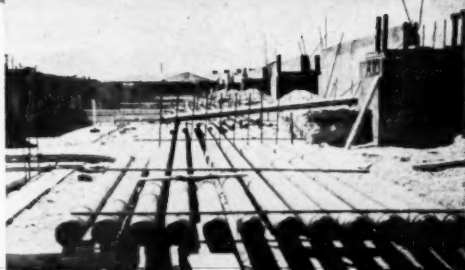


The Trade-mark
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TRIANGLE CONDUIT & CABLE COMPANY, INC.

New Brunswick, New Jersey

"Glazon" Building Wire • "Glazon" Non-Metallic Sheathed Cables • Control Wires • Armored Cable • Service Entrance, Service Drop • Varnished Cambric, Braided or Lead • Triprene Trench, Power and Parkway Cables • Bare Wire • Rigid Conduit • Hot-Dipped Galvanized and Black Enameled • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit.



Conduit wherever you look—420 tons of it! This picture shows the conduit that will carry the generator leads from the AC Power House. Triangle delivered—an schedule.



A group of Fischbach and Moore men work with Triangle conduit and cable on a control center prior to the erection of one of the buildings.

Incombustible...



That's why TRANSITE® DUCTS confine burn-outs and protect adjacent cables

DESPITE modern precautions, the burn-out is still a potential hazard. Consequently, cables should be given the maximum fireproof protection that Transite Ducts provide.

Transite Ducts confine burn-outs, safeguard adjacent cables from damage and reduce the possibilities of panic and explosion because they are incombustible throughout. Made of nonflammable asbestos and cement, Transite Ducts will not burn, smoulder or generate smoke or fumes. They cannot contribute to the formation of explosive gases.

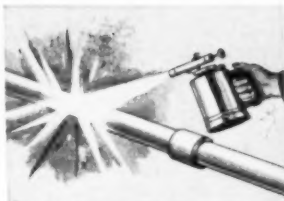
Nowhere is the fireproof protection of Transite Ducts so necessary as in such vital locations as subways, tunnels and power plants.

As the panel below shows, incombustibility is only one of the advantages of Transite Ducts. For more information, write Johns-Manville, Box 60, New York 16, N. Y.

4 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

- 1. Corrosion-Resistant.** Transite, being made of inorganic asbestos and cement, resists corrosion and is immune to electrolysis.
- 2. Permanently Smooth Bore.** Transite makes long cable pulls easy. Danger of damage to cables is also minimized.
- 3. Easy To Install.** Transite Ducts are light weight, easy to handle. Joints are quickly made. And long 10-ft. lengths reduce the number of joints in line.
- 4. High Thermal Conductivity.** Cables run cooler in Transite, reducing I²R losses, increasing current capacity and prolonging insulation life.

In Subways, where passenger safety is paramount, fireproof Transite Ducts will, in the event of a burn-out, confine it and reduce the hazard of panic.



Transite Does Not Burn, smoke or fume because its ingredients, asbestos and cement, will not support combustion. It cannot contribute to the formation of explosive gases.



Transite Provides Heat Dissipation, Too. In addition to providing fireproof construction, Transite Ducts permit cables to run cooler, reducing I²R losses.



Photograph courtesy of Triborough Bridge and Tunnel.

In Vehicular Tunnels, if a burn-out should occur, Transite Ducts limit damage, permit speedier repair and an earlier re-opening for traffic.



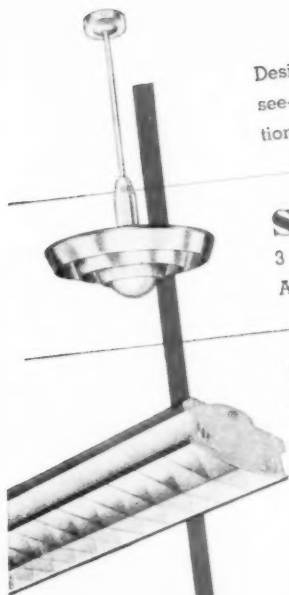
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TRANSITE KORDUCT—for
Installation in concrete

TRANSITE CONDUIT—for exposed work and installation
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3 ring, open-bottom for silver bowl lamps.
ALZAK ALUMINUM** finish. Easy to clean.

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Balanced lighting — 40% up and 60% down.
Louvres hinge to either side for easy cleaning.
300° WHITE PERMALUX finish.

For complete information on GUTH Precision-Planned School Lighting, contact your GUTH resident engineer or write us for our catalog.

* Patent Pending

**® and Patented, Aluminum Co. of America

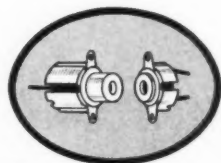
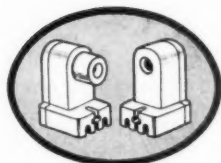
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there's a **LEVITON** lampholder

...for every type of lighting job

...and a switch
for any desired control

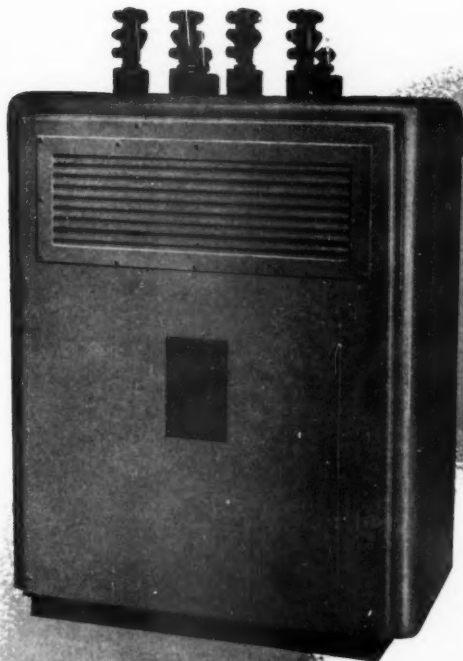


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MORE KVA PER POUND!

Lightweight, dry-type transformers save space, cut installation costs. 3 through 167 kva, single phase, or 9 through 225 kva, three phase.

They're lighter and smaller! Compact, completely ventilated coils on Hipersil® cores—neatly enclosed in sheet steel cases for convenience of mounting, cleanliness, trim appearance.

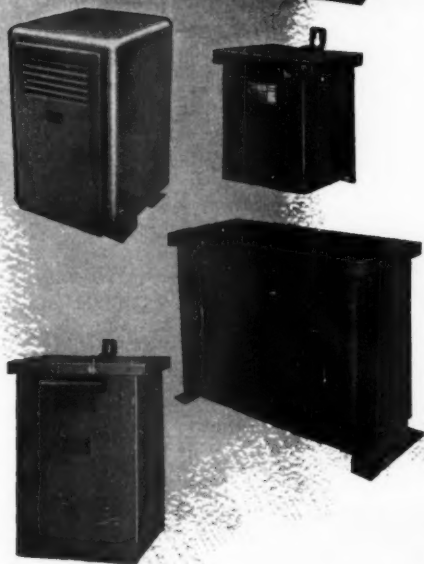
Add all this to the savings inherent in dry-type transformer design:

NO VAULTS. Mount them on the floor, walls, posts or overhead platforms, close to the load they serve. They're safe.

SIMPLIFIED MAINTENANCE. No liquids to store, filter or replace. No gauges, radiators, valves or gaskets to get out of order.

Westinghouse Dry-Type Transformers are available for voltage step-down or step-up applications or for phase changing. Types AJRB and AVR8 (3 through 100 kva) have circuit breakers built into the high-voltage circuit, giving 3-way protection against damaging overloads or short circuits, cutting installation time up to 50%. Ask your Westinghouse representative for a copy of B-4428, or write Westinghouse Electric Corporation, P. O. Box No. 868, Pittsburgh 30, Pennsylvania.

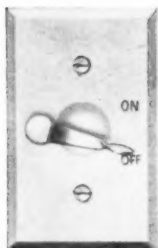
J-70607



YOU CAN BE SURE... IF IT'S
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**DRY-TYPE
TRANSFORMERS**



for

weatherproof devices

THE ANSWER IS BRYANT

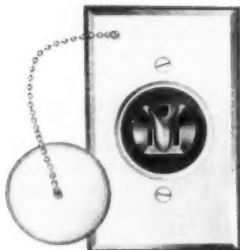
BRYANT NO. 4421

Weatherproof Switch. "T"
Rated Flush Tumbler Switch.
Available in single pole, dou-
ble pole, 3-way and 4-way
types—10 Amperes, 125 Volts,
5 Amperes, 250 Volts.

For porches, terraces, barnyards — for any place where dampness or the elements make the installation of ordinary wiring devices undesirable. Here are three devices from the full line of Bryant Weatherproof switches and outlets. These devices are equipped with weatherproof mats and metal plates finished to resist corrosion.

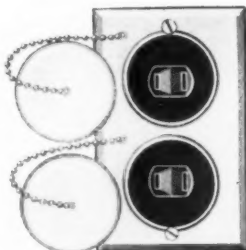
Bryant No. 5260

3-wire grounding type,
outlet with thread-on
cover — 15 Amperes,
125 Volts.



Bryant No. 3894

Weatherproof Outlet.
2-wire, duplex, parallel
slots, thread-on covers
— 15 Amperes, 125
Volts, 10 Amperes, 250
Volts.



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When you want a motor for use in explosive atmospheres, you *always* look for the Underwriters' label—assurance that the motor is approved for operation in Class I Group D hazardous locations.

Fairbanks-Morse Explosion-Proof Motors carry that label—your assurance of motor safety under this class of hazardous conditions.

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When you look for electric motors—for standard or unusual applications—*always* look for the Fairbanks-Morse Seal. For over 120 years it has stood for the finest in manufacturing integrity—to *all* industry. Fairbanks, Morse & Co., Chicago 5, Ill.



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EMPLOYEES SAY,

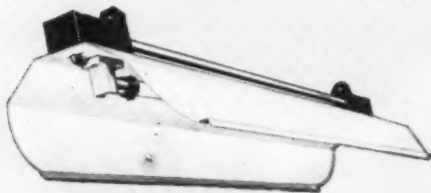
1000-watt mercury high-bay
luminaire 25 ft. and over



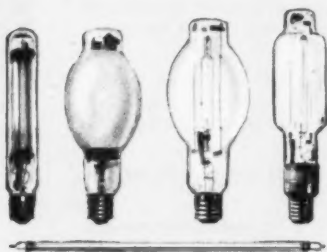
400-watt millite luminaire
16 ft. and over



400-watt mercury luminaire
16 ft. and over



3000-watt mercury luminaire
40 ft. and over



Complete range of lamps, including the
new color-corrected J-HI 400-watt lamp.

Complete range of ballasts for high
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"Better than daylight"

with Westinghouse MERCURY lighting

"We get over 50 footcandles evenly distributed in this work area—and have completely eliminated the need for auxiliary lighting," says Chief Electrician of an Ohio plant about their new main high-bay-assembly area.

What's more, he further states that the employees report, "It's even better than working in daylight . . . there are no shadows or glare." A Westinghouse combination mercury-incandescent system takes credit for these results.

He concluded, "We have always believed that high-quality illumination pays for itself in more

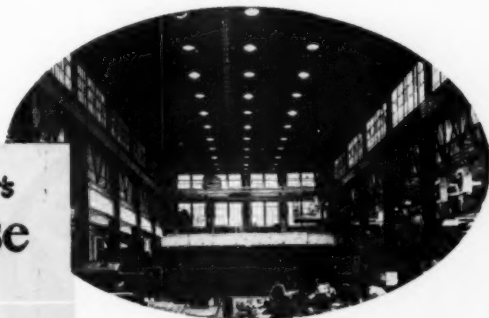
and better work, fewer errors . . . and this installation, made according to a plan, proves that it does just that." Only Westinghouse can offer you the complete mercury system—luminaires, lamps, and ballasts.

It will be well *worth your while* to investigate Westinghouse, where you can review all sources and all types before selecting one system. Get B-4727, "Lighting at Work" in every industrial area. Call your nearest Westinghouse Office or write: Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-04298



YOU CAN BE **SURE**...IF IT'S
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LIGHTING DIVISION
Edgewater Park, Cleveland



PARAMOUNT FRICTION TAPE by Haartz-Mason

1

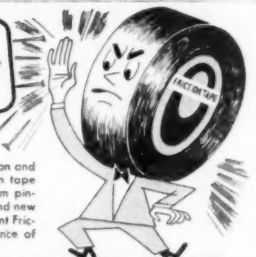
STRONG!



Made under the most exacting requirements in the industry, Paramount Friction tape can be tightly wrapped — yet can be torn readily as required. A margin of safety in this respect is added to every roll of Paramount Friction tape.

2

FREE OF PINHOLES!



In order to assure maximum insulation and protection against moisture, friction tape should be as free as possible from pinholes. The materials and methods and new equipment used in making Paramount Friction tape assure virtual non-existence of pinholes.

3


WON'T RAVEL!



Automatically cut with smooth, neat edges on Cameron cutting machines. These machines wind it on the cores under tension. This is your insurance against raveling.

4

PLENTY OF ADHESION!



Under controlled temperature and humidity, Paramount Friction tape is strictly tested for permanence of adhesion.

5

AGES SLOWLY!



Taken from stock at regular intervals, sample rolls of Paramount Friction tape undergo accelerated aging tests in an electric oven at 212° F. for 16 hours. Thus you get a guarantee of maximum aging ability.

6

CUT EXACTLY TO SPECIFIED LENGTH!



Every roll of Paramount Friction tape is sold with guaranteed minimum footage per roll plus . . . guaranteed weight. You are left in no doubt about what you are getting. And so you know you will cover the largest area most efficiently at the lowest cost.

7

PRE-TESTED AT THE FACTORY!



To sum up, Paramount Friction tape, besides being made of finest materials, also undergoes rigorous pre-testing at the factory. Among the rigidly conducted tests are those for aging, adhesion and strength.

Dual Guarantee on Weight and Length




Manufactured by
Haartz-Mason, Inc.
WATERTOWN 72, MASS.



PARKWAY CABLE



Save the cost of duct systems!...with the most dependable Parkway Cable you can buy!

ROEBLING'S research staff is continually working at the job of product development. Our manufacturing facilities and techniques are constantly improved. That's why our Parkway Cable for distribution and general power supply circuits is today even more dependable than ever before.

Roebbling Parkway Cable saves money right from the start because it is buried directly in a shallow, low-cost trench. It is made in single and multiple conductor — solid or stranded — in a range from

600 to 5,000 volts...furnished with metallic armor or a non-metallic *Roeprene* sheath, depending on the physical protection required. Types that pass all C.A.A. requirements for Specification No. L-824 for airport lighting are also available.

Large quantities of Roebbling's full line of electrical wires and cables are needed in the rearmament program. We and our distributors will do everything possible, however, to meet your requirements. John A. Roebbling's Sons Company, Trenton 2, N. J.

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NAVIGATION BLVD. • LOS ANGELES, 5340 E.
HARBOR ST. & 120 S. HEWITT ST. • NEW YORK, 19
RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST.
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1301 CLARK BLDG. • ROCHESTER, 1 FLINT ST.
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Since the introduction of fluorescent lighting...



greatest **STEP UPWARD**
in industrial SEEING COMFORT
...new **BENJAMIN** "Task Master"

Shatters precedent with a completely new concept of lighting unit design!

Masters the brightness ratio problem by directing approx. $\frac{1}{4}$ of light upward!

Doubles...even triples...present standards for industrial seeing comfort!

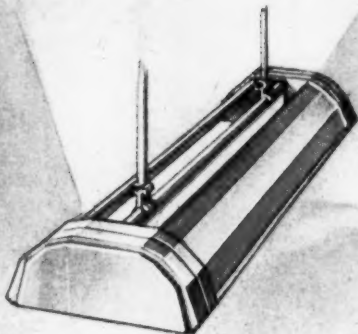
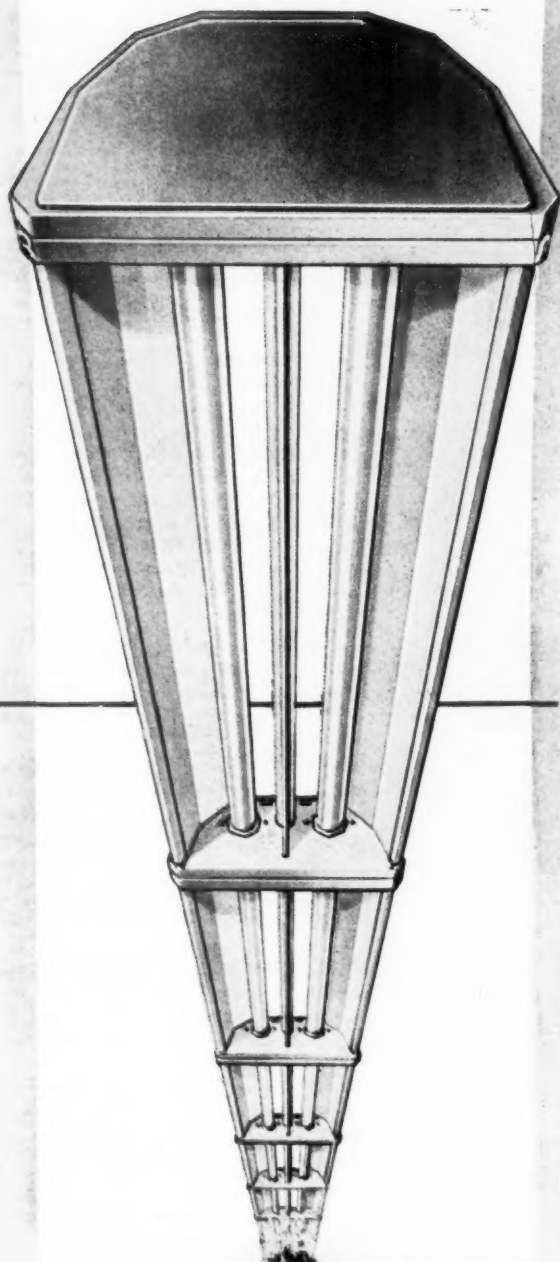
Introduces new methods of installation and maintenance!

Yes, the new Benjamin "Task Master" is the greatest step UPWARD in industrial fluorescent lighting history. It's a step UPWARD to high lighting levels without the discomfort which can often accompany them... a step UPWARD to complete freedom from annoying ceiling contrast that may cause excessive brightness ratios. It's a step UPWARD to greater seeing comfort in Amer-

ica's work places! Moreover—"Task Master" represents a great step UPWARD in high-speed installation and trouble-free maintenance, as shown above. Get full details about this greatest step UPWARD in industrial seeing comfort... send for FREE "TASK MASTER" Data Bulletin, containing complete specifications. Write:

Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Ill.





3 ways to mount: chain, conduit and sliding hanger suspension (illustrated).

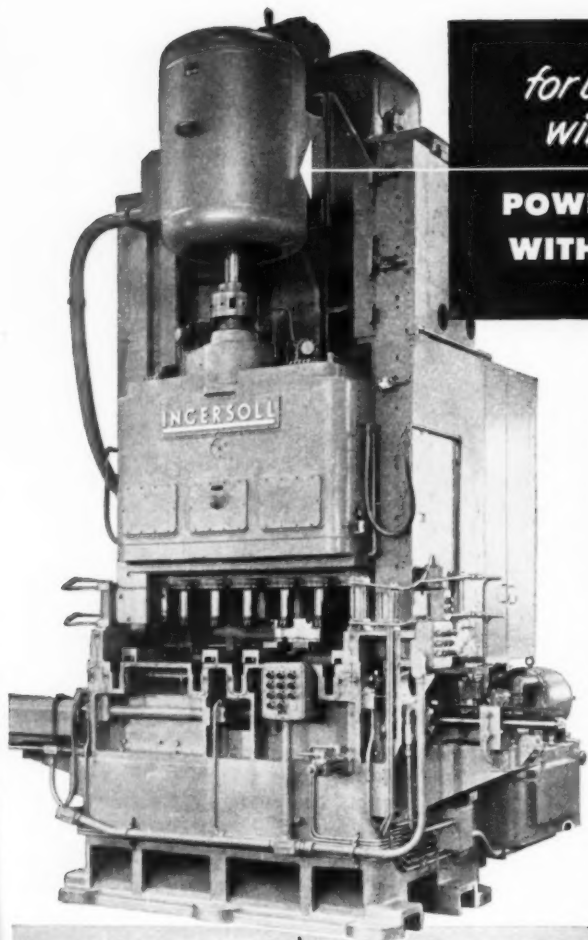
UPWARD ILLUMINATION COMPONENT directs approximately $\frac{1}{4}$ of light towards the ceiling. In addition to providing more generous **UPWARD** flow of light, this unique construction reduces maintenance expense as it practically eliminates horizontal areas where dust and dirt can collect.

DETACHABLE REFLECTORS are hinged to facilitate easier, more thorough cleaning right on the fixture; or they may be quickly unhinged and replaced with reflectors which were previously cleaned at a bench. 2 simple spring-type clips lock or release each reflector . . . no tools needed.

PRE-WIRED . . . NO WIRE SPLICING . . . All Connections made to Terminal block. No need to run line wire through fixture. Furnished with branch circuit wiring already run through a combination spine support and lamp shield. (Shielding angle is 35°) Just connect line wires to terminals (see picture A above). For continuous line installations, simply connect "jumper" wires to opposite terminal blocks (see picture B).

BALLAST AND TERMINAL BLOCK are strategically located in easily-accessible and sections . . . out of the way for more streamlined appearance.

Of course, **EXCLUSIVE BENJAMIN "SPRINGLOX" LAMP HOLDERS** are standard equipment. They are acknowledged as embodying the most advanced lampholder features. Such as: rugged, all-metal construction and unique, patented spring design for "quick-in, quick-out" lamp maintenance.



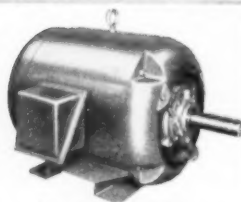
*for better performance
with less down-time*

POWER YOUR EQUIPMENT WITH **Wagner** MOTORS

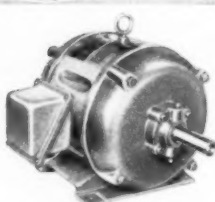
Modern high-speed production is based on the ability of machine tools to turn out a continuous flow of identical parts. Precision is all-important—so is continuity of operation. Machine tools powered with Wagner totally-enclosed Motors are assured freedom from excessive down-time caused by motor failure, because these motors are designed to operate under the adverse conditions often encountered in machine tool operation. They are fully protected against steel-filings, chips, dust, dirt, fumes and moisture. They require no maintenance other than periodic lubrication.

The machine pictured here does rough boring of 6-cylinder engine blocks. It is equipped with Wagner totally-enclosed fan-cooled motors. At the top is a 100 hp Wagner Type CP.

When you power your equipment with Wagner Motors, you have assurance of uniform performance with exceptionally little trouble . . . Wagner Motors are known for completely dependable operation in their specific applications.



Type CP totally-enclosed,
fan-cooled motor.



Type TP totally-enclosed,
non-ventilated motor.

When you standardize on Wagner Motors—you get the advantages of a liberal warranty . . . of nationwide service facilities, with replacement motors and parts available from more than 650 Authorized Service Stations plus 25 Wagner-owned Service Branches.

You can choose from a wide variety of types and sizes (from 1/125 to 400 hp). Bulletin MU-185 gives complete information—write for your copy.



WAGNER ELECTRIC CORPORATION
6413 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES



NO OBJECTIONABLE HUM

Due to advanced
Engineering
and Precision
Manufacture



CERTIFIED
LIGHT IN
WEIGHT



NEW

JEFFERSON

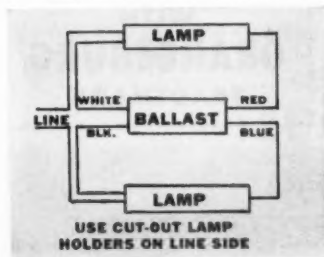
254-511 BALLAST

for Series Operation of Two 96T12 Lamps 430MA



(Photo Courtesy of Curtis Lighting Inc., Chicago, Illinois)

White and red leads connect to one
lamp,—black and blue to the other.



• Specialists for over 35 years in the design and manufacture of transformers and ballasts, Jefferson engineering design, research, and experimental work has been constantly directed to achieve the highest uniform quality. Equally important are Jefferson's facilities and skills gained through long experience in making superior electrical products.

The new Jefferson Series Sequence Ballast meets all requirements of the proposed American Standard Association Test Specification C82.1. It is cooler operating, delivers full rated wattage to the lamps with low watt loss, operates with no objectionable hum, and assures full brilliancy from both lamps. Positive starting is provided at voltages as low as 106 volts—with no detrimental effect on lamp life.

JEFFERSON ELECTRIC COMPANY Bellwood, Illinois

In Canada: Canadian Jefferson Electric Co., Ltd., 384 Pape Ave., Toronto, Ont.

On the Job

with **ORANGEBURG**
FIBRE CONDUIT



Always Profitable to the Contractor



The Trend is to go underground. Where direct burial is practical, Orangeburg NOCRETE is ideal because it has heavier and thicker walls for one and two duct installations without concrete encasement. Serves factories, schools, colleges, hospitals, drive-in theatres, power and telephone systems, also service entrances, airports. Orangeburg NOCRETE saves time, work and money for the contractor.

NOCRETE Installed without Concrete



In every city and state there is a well defined preference for Orangeburg STANDARD, installed with concrete where banks of three, four or more ducts are required. Orangeburg STANDARD is widely used by utilities, municipalities and industry. For 58 years it has been a favorite of design engineers and contractors everywhere.

Quality, dependability and profitable ease of installation has won for Orangeburg STANDARD nationwide approval.

STANDARD Installed with Concrete

No special tools needed

Orangeburg is easily worked in the field, easily sawed, easily tooled with an inexpensive lathe. Long light lengths saves time—speeds up the job.



Taper-Sleeve Joints stay tight

The joints are surprisingly easy to make. A few light hammer taps drive them up tight. Corrosive ground waters do not enter. These Tapered Sleeve Joints are famous because they stay tight permanently.



Less Breakage

Orangeburg is tough, resilient and rugged—seldom breaks when handled with ordinary care. This is added insurance of a good profit—without little losses to write off.

Bigger Payloads

Big capacity truck loads of Orangeburg are easily hauled without damage—and with fewer trips. The transportation costs are low—the job is speeded up—good profit points for the contractor.

Outstanding Features

Orangeburg lays faster and at lower cost than any other type of conduit. Impermeable wall and tight joints keep out corrosive ground waters • Low coefficient of friction keeps pulling tension on cable to minimum • Protects cable sheath from abrasion when pulled in • Resists acids, alkalis, salt, grease and oil • Light, easy to handle and tool in the field.

Send for Bend Section Folder

This shows ingenious ways to get around trouble spots with Orangeburg Bend Sections. Folder sent FREE on request.



New Catalog 51 is also available. Write to Dept. ECs for this booklet which tells the story of Orangeburg Fibre Conduit—both STANDARD and NOCRETE. Orangeburg Manufacturing Co., Inc., Orangeburg, N. Y.

**NOW BRANDED
WITH
ORANGEBURG®
TRADEMARK**

Graybar
ELECTRIC COMPANY

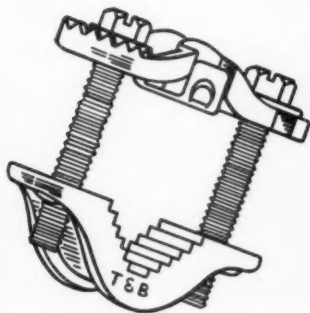
DISTRIBUTORS,
ORANGEBURG
FIBRE CONDUIT

GENERAL ELECTRIC
SUPPLY CORPORATION

BRANCHES AND STOCKS IN PRINCIPAL CITIES



You can handle any grounding job with 10 Standard T&B Engineered Parts!



Cut Inventory . . . Save Time . . . Stock 5 Clamps and 5 Hubs . . . Make 30 Ground Fitting Combinations—IN SECONDS!

FOR INSTANCE . . .

You can run *conduit-protected* ground wire through any conduit size from $\frac{1}{2}$ " to 1"—and ground both conduit and wire to any water pipe from $\frac{1}{2}$ " to 6". Just combine the conduit hub and water pipe clamp you want.

You can ground #8, 6 or 4 *armored* wire to the same range of pipe sizes. Just bolt an armored-wire hub to the right size clamp.

Or you can attach #8, 6 or 4 *bare* wire to the solderless grip on the clamp—no hub needed!

T&B ENGINEERED FEATURES for lowest installed cost

No soldering—Hubs and clamps have built in solderless connectors . . . Easily installed—with wrench or screwdriver . . . Flexible—teeth on hubs and clamps permit locking at any angle. When enclosed ground conductor required, use combination of hub and clamp. Clamps can be used alone with bare ground conductor up to #4 wire . . . UL approved, meets 1951 NEC Code.

ENGINEERED RIGHT . . . DISTRIBUTED RIGHT!

T&B Engineered Hubs and Clamps, like all T&B quality fittings, are designed for lowest installed cost. Furnished 100% through T&B distributors under the T&B Plan.

"YOU JUST PICK THE HUB
PICK THE CLAMP.
PUT 'EM TOGETHER...
THAT'S ALL!"



THERE'S A



ENGINEERED

PRODUCT

for every
wiring job
in the
complete T&B
line of fittings
for all
conductors and
raceways



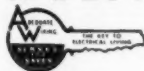
THE THOMAS & BETTS CO.

INCORPORATED

34 Butler Street
Elizabeth 1, New Jersey

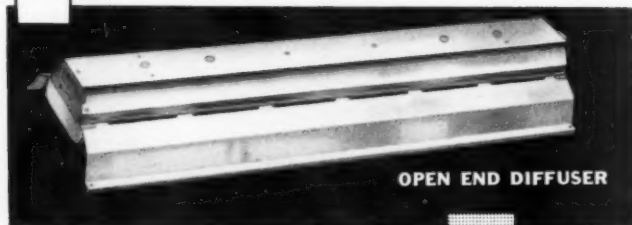
Thomas & Betts, Ltd., Montreal, P. Q., Canada

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1898





UP and DOWN LIGHTING
for better seeing conditions



OPEN END DIFFUSER



Wheeler

DIFFUSER TYPE FLUORESCENT FIXTURES

Get the benefits of greater seeing comfort — reduced brightness contrasts — with the new DIFFUSER TYPE Fluorescent Fixtures — pioneered by Wheeler! Apertures located in the top of the all-white porcelain enameled steel reflector direct approximately 5% of the light upwards . . . lessen contrasts . . . provide more comfortable seeing and working conditions. Fixtures are available for use with all Slimline and General Line Fluorescent Lamps. Write Wheeler Reflector Company, 275 Congress Street, Boston 10, Massachusetts.



CLOSED END DIFFUSER

Wheeler

REFLECTORS



Distributed Exclusively
Through Electrical
Wholesalers

MADE BY SPECIALISTS IN

"SKILLED LIGHTING"

EQUIPMENT SINCE 1881

New Life-Line Safety Switch Stands up...Stands out!



FULL LINE—FOR EVERY APPLICATION

Looking for a chance to cut idle machine time and unpredictable maintenance load? Here's a performance-proved opportunity—with the newly strengthened, newly styled Westinghouse Life-Line Safety Switch.

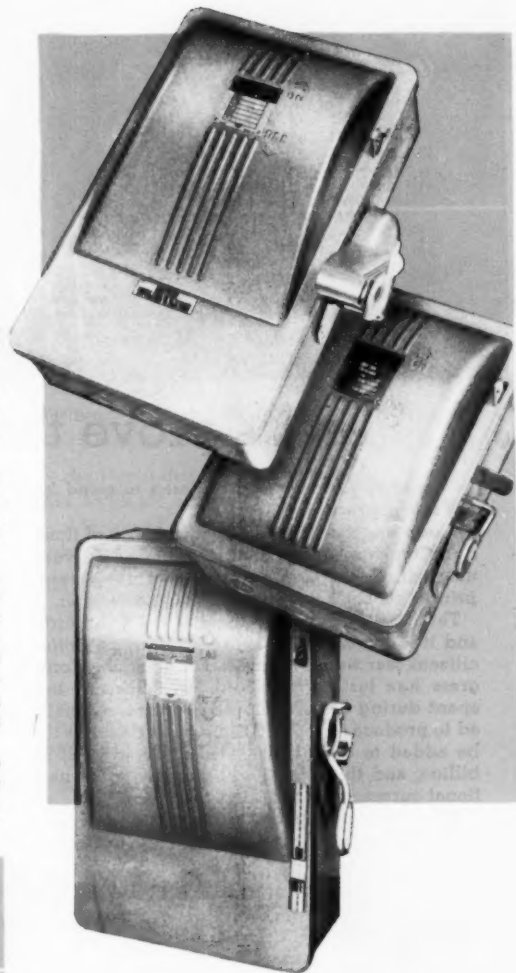
For two reasons. First, precise and positive action protects your circuits and equipment when emergency demands it. MICARTA® crossbar, now 50% to 100% stronger, assures unit action of contact blades and follow-through action of the operating mechanism.

Second, Westinghouse Switches are long lived—diamond-pointed break jaw and extended blade eliminate burning of contact areas. "De-ion*" Arc Quenchers suffocate arcs in a twinkling. One-piece copper construction means fewer current-carrying joints and loose connections, resulting in less wattage loss.

Whether fused for circuit protection or unfused as a disconnect, there is a complete line of safety switches in types A, C and D for NEMA Type 1 applications.

Your Westinghouse Distributor will be glad to help you. Or write for Booklet B-5457, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Penna.

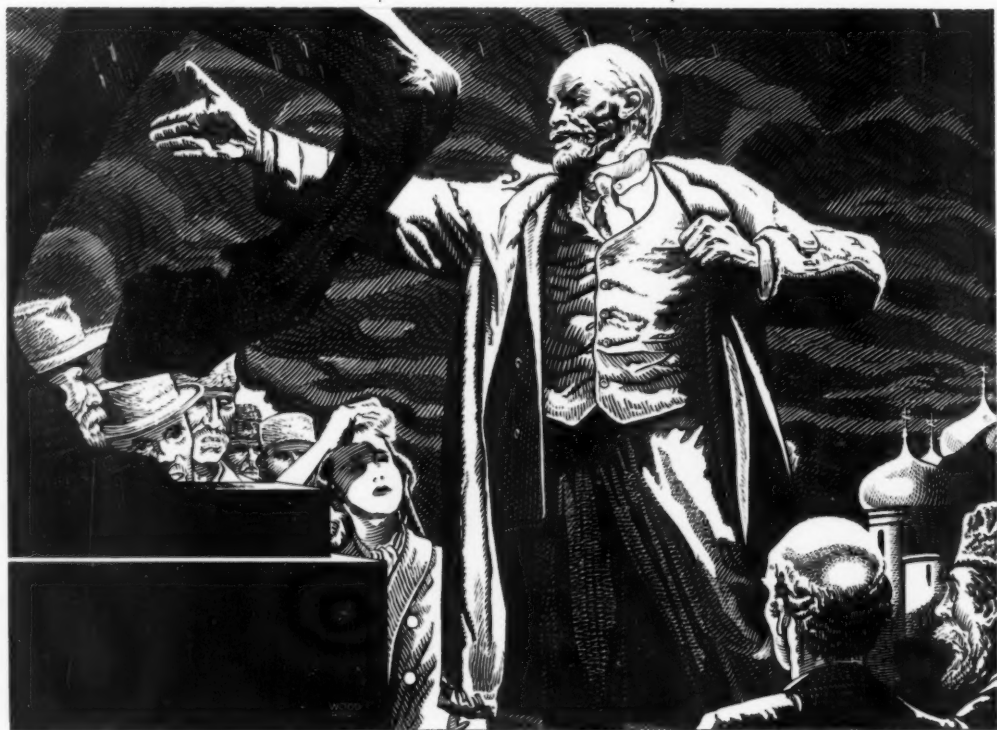
J-30083



YOU CAN BE SURE...IF IT'S
Westinghouse

Life-Line

SAFETY SWITCHES



Let us prove this prophet false

"We shall force the United States to spend itself into destruction."

These are the words of Lenin, father of Russian Communism. Quoted from page 191, volume xxi, of his *Collected Works*, they were printed recently in a metropolitan newspaper.

This is the announced goal of the Politburo, and it is the direction in which many patriotic citizens fear we are headed. For example, Congress has just appropriated \$87 billion to be spent during 1952, and enacted taxes estimated to produce only \$71 billion. The deficit is to be added to our national debt, already \$259 billion; and this deficit will depreciate the national currency by another \$16 billion.

Part of this stupendous appropriation is to re-arm ourselves and the free world against Com-

munist attack. But what about the rest of our spending?... Let us also be realistic. It is time for us as a nation to pause, reflect and consider well. We can do three things to avoid national bankruptcy:

1. Eliminate every non-essential federal expense.
2. Provide taxes to pay all obligations as we go.
3. Pay off some of our national debt every year.

Let every citizen who believes in preserving our nation from the economic termites within, as well as from the announced enemy without, become an active worker to prove the Russian prophet false.



The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND VOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

To get efficient fluorescent lighting ... insist on

This Shield on your ballast



There's more to satisfactory fluorescent lighting than lamps and a reflector. There's always a ballast in the fixture . . . and the way it performs determines whether you'll get *full lamp life, rated light output and satisfactory performance.*

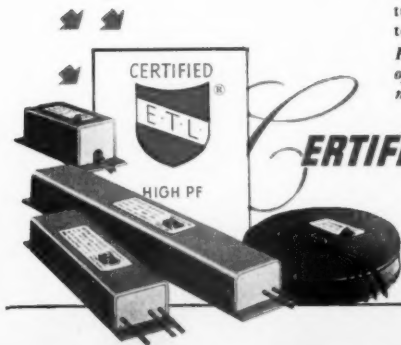
Only CERTIFIED BALLASTS carry the shield that assures best lighting.

That's because CERTIFIED BALLASTS are made to precise specifications, then tested by Electrical Testing Laboratories, Inc., which certifies they conform to these high standards.

There's no excuse for inefficient, unsatisfactory fluorescent lighting when CERTIFIED BALLASTS are available.

Be sure every fixture you get has CERTIFIED BALLASTS . . . the ones with the shield.

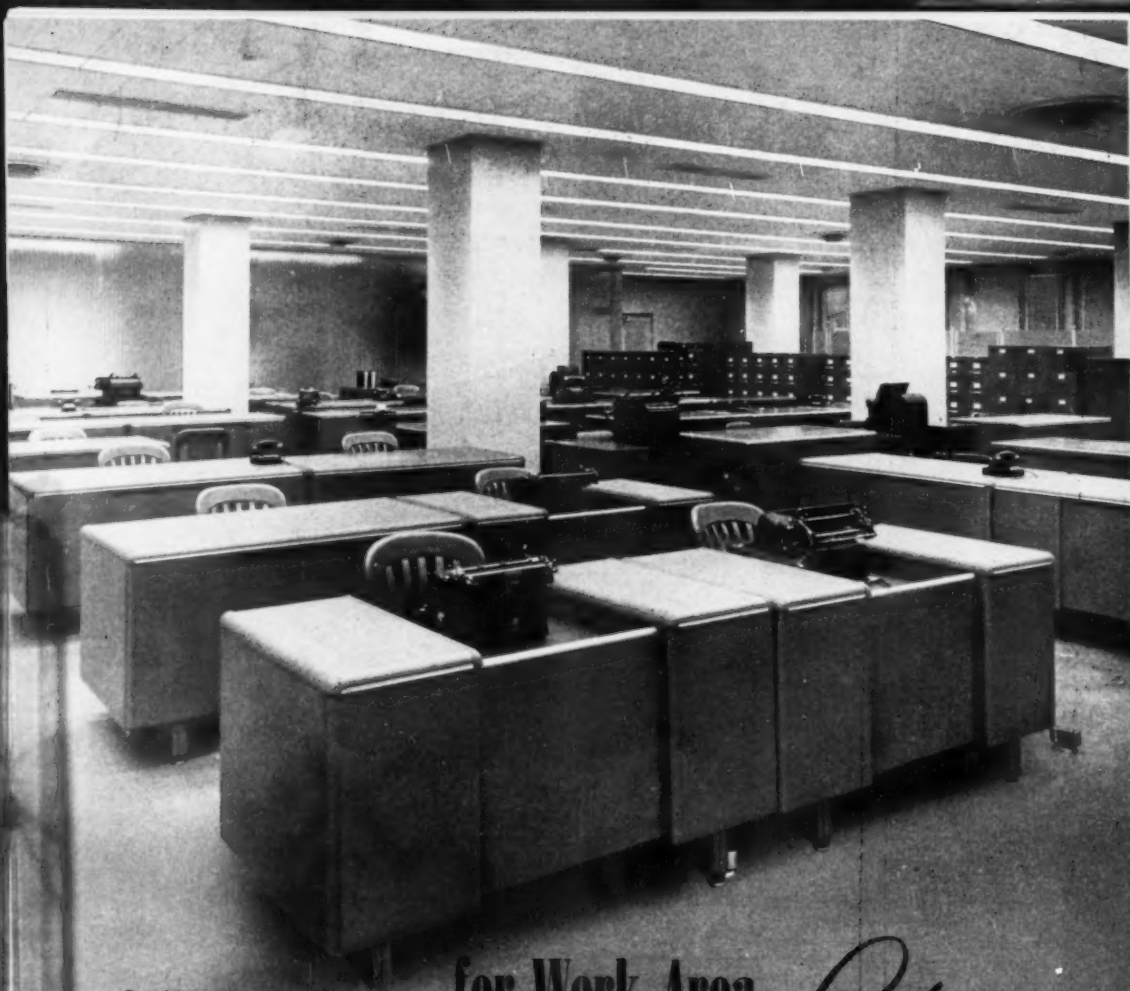
● Complete information on the types of CERTIFIED BALLASTS available from each participating manufacturer may be obtained from Electrical Testing Laboratories, Inc., East End Ave. at 79th St., New York, N. Y. Participation in the CERTIFIED BALLAST program is open to any manufacturer who complies with the requirements of CERTIFIED BALLAST MANUFACTURERS.



CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO



One of the
General Offices
H. J. HEINZ COMPANY
Pittsburgh, Pa.

for Work Area *Lighting* look to

In office or plant, drafting room or classroom—Pittsburgh Permaflexor Lighting Equipment assures you the light you need where it's needed. Standard fluorescent, incandescent and combination units give custom lighting results for general and critical seeing tasks.

PITTSBURGH REFLECTOR COMPANY

404 OLIVER BUILDING • PITTSBURGH 22, PENNSYLVANIA

MANUFACTURERS OF FLUORESCENT & INCANDESCENT LIGHTING EQUIPMENT

Permaflexor Lighting Engineers in All Principal Cities

PLANNING NEW LIGHTING?

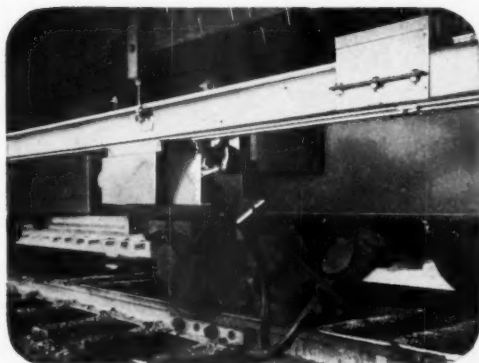
We have a series of booklets on Office, Store, Bank, School and Plant Lighting. Write for booklets which interest you.



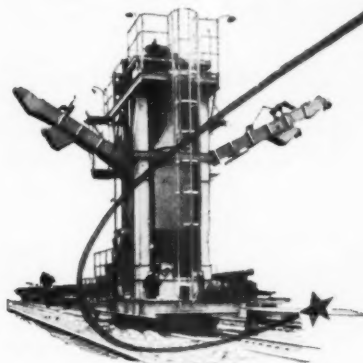
PITTSBURGH PERMAFLECTOR LIGHTING EQUIPMENT IS DISTRIBUTED BY BETTER ELECTRICAL WHOLESALEERS EVERYWHERE

From

FREIGHT CAR ICING

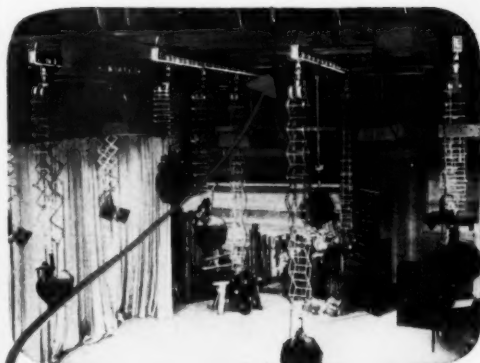


Above, track and trolley supplying current to one of two icing machines, shown below, developed by Railways Ice Co., and built by Link Belt Co., for Denver & Rio Grande Western R.R.



To

TELECASTING



Feedrail powers and positions vertically heavy TV lights by a flick of a switch.

ELECTRIC FEEDRAIL®

Mobile Power Outlets

Move Jobs on Schedule



A freight car iced in fifty seconds! Only a ten second interval between cars! That's how trainloads of perishable freight are now iced and speeded to market on schedule. When this modern icer is on the move, power is supplied by Feedrail for twelve motors totaling 179 HP plus 7½ KW for communications, lighting and coded control. In telecasting, split-second timing to keep on schedule is essential. Feedrail mobility speeds the rearranging of studio lighting and provides a dependable, unfaltering source of power.

Industry is always on the move. Product changes demand flexible electrical power distribution. Moving Feedrail trolley outlets enclosed in overhead tracks roll quickly to where power is needed. When major changes are required — dismantle, rearrange and remount, reusing original units. Add or remove machines, without delay, to speed change-overs and work in process. Unit costs will decrease in direct ratio to the increased production facilities which Feedrail versatility affords. Write for literature.

Sold by leading electrical distributors.

46-B

**ELECTRIC
FEEDRAIL®**

Never Becomes Obsolete

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET • NEW YORK 7, N. Y.

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . MAY, 1952

55

*Helping
your
wholesaler
...help you!*



These are the manufacturers of lighting equipment whose advertising appeared in the April issue of **ELECTRICAL WHOLESALING**. We're calling your attention to their effort because of the important service—and profit-building—benefits it develops for you.

Here's How!

Their advertising gives your wholesaler's salesman a *big hand* . . . helps to make—and keep—him a *well-informed lighting salesman*. It equips him to discuss your lighting problems more intelligently . . . save you valuable time . . . and assist you in the selection of proper lighting equipment.

So Remember!

Alert electrical wholesalers and their salesmen have both the information and facilities to help you sell more *profitable* lighting jobs. By working with them . . . making the most of their intimate knowledge of lighting products . . . and by writing high-quality lighting equipment into your specifications, you can reap a larger share of today's big construction dollars.

Alert electrical wholesalers and their salesmen read
ELECTRICAL WHOLESALING —
The National Magazine of Electrical Wholesale Distribution



**ELECTRICAL
WHOLESALING**

A McGraw-Hill Publication, 330 West 42nd Street, New York 36, N. Y.

Lighting Equipment Advertising In The April Issue of **ELECTRICAL WHOLESALING**

ADVANCE TRANSFORMER CO.
APPLETON ELECTRIC CO.
AUSTIN CO., THE M. B.
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CERTIFIED FLEUR-O-LIER MFGRS.
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SYLVANIA ELECTRIC PRODUCTS, INC.

To Supplement your Short Supply of Copper Wire and Cable

USE ALUMINUM



AN EXCELLENT ALTERNATE FOR COPPER

BULLETIN No. 521

CRESCENT Aluminum Building Wire



ALUMINUM is a good alternate for copper for the conductors in Building Wires and Cables. Aluminum conductors, particularly in the larger sizes, will show a substantial saving in cost per ampere of useful circuit capacity in many cases, as compared with copper.

CRESCENT Aluminum Building Wire is made with ENDURITE Heat-Resistant Insulation in sizes from No. 14 AWG to 1,000,000 CM in Type RH-75°C Cable Type.

Aluminum has long been used for electrical conductors. Best transmission lines of aluminum have been used for over forty years under all types of atmospheric conditions. Aluminum is used for heavy bus construction and is preferred for this purpose in the electrochemical industry because of its ability to withstand the highly corrosive conditions which are present in the industry. In the case of electrical equipment plant aluminum has been used in use with the utmost satisfaction since 1920 and this appears all things being equal, aluminum building wire has been used extensively in Europe for many years with proven satisfactory service.

UNDERWRITERS' LABORATORIES APPROVAL

In August, 1916, the Underwriters' Laboratories issued a special bulletin instructing their inspectors to accept on and after September 1, 1916, aluminum conductors No. 12 AWG and larger in the standard types of building wire. This Underwriters' Laboratories label for A.C. wire will be placed on the tag attached to each coil or reel of Crescent Aluminum Building Wire or Cable. The letters "AL" will appear after the use of wire on the material tags, as well as in the printing on the surface of the wire, so that the aluminum wire can be identified readily. Material tags will be of a special color for your easy identification of the aluminum conductors.

CRESCENT has had much experience in the manufacture of insulated aluminum conductors. CRESCENT ALUMINUM Building Wire employs ENDURITE heat and moisture resistant insulation in sizes No. 14 AWG to 1,000,000 CM as Underwriters Laboratories "TYPE RH-75° C. or RW-60° C."

CRESCENT ALUMINUM Service Cables are available in size No. 6 AWG and larger as Service Drop (Type SD); Service Entrance (Type SEU); or Underground (Type USE, style RR).

CRESCENT ALUMINUM Power Cables can be furnished with rubber, thermoplastic or varnished cambric insulation and with braid, neoprene jacket, lead or armored coverings. We will welcome your specific inquiries.

Under the C.M.P. Program, it is necessary to get an allotment of aluminum for insulated electrical cables from your Claimant Agency.

Your Electrical Distributor and the CRESCENT Sales Representative will be glad to work with you in obtaining additional desirable aluminum cable above what you can get in the critically short copper types.

Send Now For Bulletin No. 521
It Gives Complete Information



CRESCENT



WIRE & CABLE
CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

BUS DUCT IS FLEXIBLE

**Modernize now
or you may have to
improvise later**

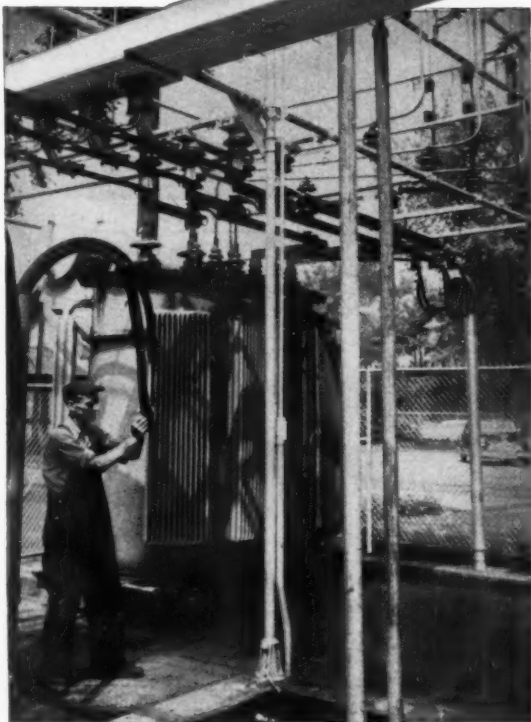
Pound for pound, Westinghouse Bus Duct delivers more power than comparably rated systems of wiring, cable or conduit. And—the longer the run, the greater the saving.

As one large manufacturer in the metal working industry said: "We found a tremendous saving in the materials purchased, to say nothing of the far lower labor cost for installation. Wire and conduit alone would have exceeded the cost of the Westinghouse Bus Duct installation. We also found in Westinghouse Bus Duct the flexibility we just had to have in running power from floor to floor".

The 4,000-ampere duct illustrated is part of a 1,200-foot system installed with the addition of new automatic machinery to the production line.

Plug-in receptacles every foot of plug-in duct speed machine tie-ins, simplify change-overs or line expansions.

For details on further advantages, call your nearest Westinghouse representative, or write for Manual B-4272-A, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-30061



Westinghouse 4,000-ampere Weatherproof Low-Impedance Bus Duct connected to 480-volt buses of 1,500-kva transformers. 2,400-ampere cables are being disconnected.

YOU CAN BE SURE.. IF IT'S
Westinghouse

BUS DUCT



Washington Report

CMP decontrol is being opposed by many class "B" product makers now operating under these controls. CMP improves metals deliveries, permits smoother production scheduling, they claim. But NPA now expects to abolish most controls by year-end, modified of course, to conform with Congress' action on extension of the Defense Production Act.

Copper is an exception. In spite of copper producers' continued predictions of increased production, which NPA officials say don't materialize, demands continue far in excess of supply. NPA now thinks copper controls will be needed for some time.

A copper expansion goal of 2,270,000 tons of domestic production from ore, imports and old scrap has been set for 1955 by DPA, which should meet anticipated requirements for military, atomic energy and civilian use, and for export and stockpiling. Government will aid in meeting this goal.

Increased allocations of copper were asked for by the wire and cable IAC, meeting with NPA in mid-April, as recent allocations were at such low level as to require reduction in operations causing unemployment and delay in filling CMP allotments for wire mill products. Members favored partial decontrol of copper in near future, with priority system for military purpose but a free market for all other uses.

Zinc supply in U. S. now exceeds current rate of use, the primary zinc producers IAC told NPA recently in asking for revocation of Order M-9. 1952 supply (domestic and foreign sources) is estimated at 969,000 tons, consumption at 933,000 tons.

Second quarter construction project approvals with allotments of materials total: industrial—1,458 projects with estimated cost of over \$7-billion (overall project costs); commercial—1,599 projects with estimated cost of \$726-million.

Builders of primary and secondary schools and public roads may self-authorize more materials for individual projects beginning July 1. Details will be given in an early amendment to CMP Reg. 6.

Commercial construction will get more than double its second quarter allotments of structural steel in the third quarter, NPA has announced. Reason: Peak demand of industrial expansion program was passed in second quarter.

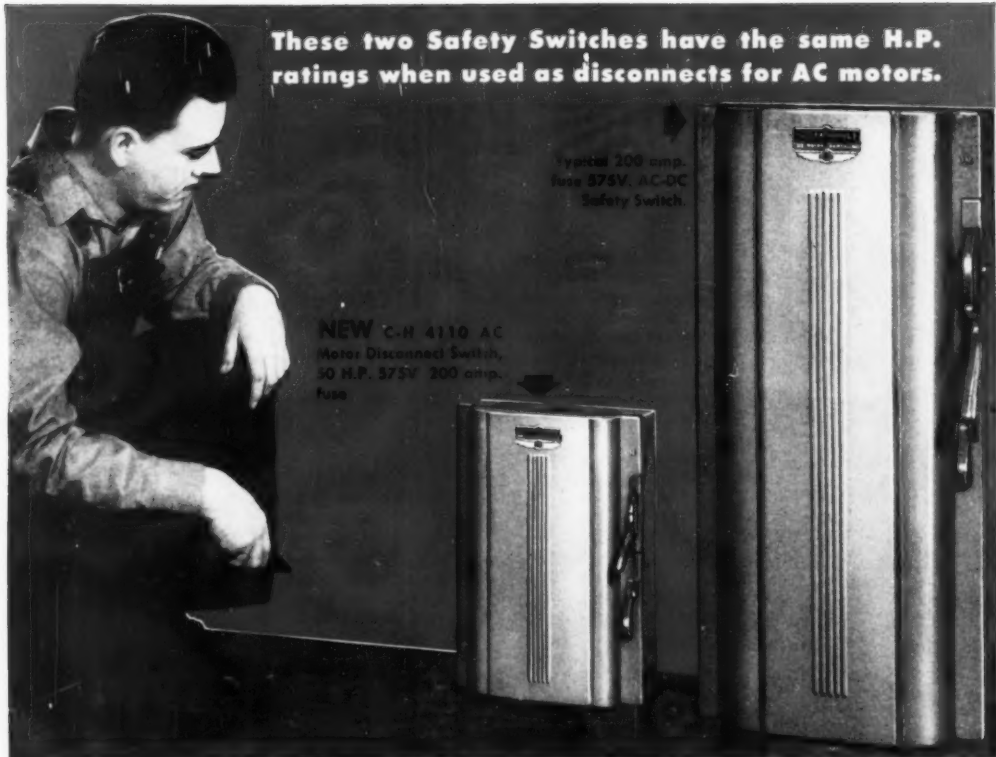
Practices considered unfair to the mechanical specialty contracting industries (electrical contractors, plumbers, etc.) would be eliminated in federal construction projects under terms of a bill (S. 2907) introduced in the Senate March 24 by Senators Harley M. Kilgore (D., W. Va.), John Sparkman (D., Ala.), and Homer Ferguson (R., Mich.), designed to curb unethical contracting practices on federal projects. The bill, titled "Federal Construction Act of 1952" has the active support of NECA and other specialty contractor associations affected.

Production of low voltage distribution equipment in 1951 totaled \$178-million, goal established by NPA and members of that industry's IAC in November, 1950. 1952 goal is now set at \$190-million. Fuse production in 1951 was \$29-million.

Shipments of incandescent and fluorescent lamp bulbs in 1951 totaled \$280-million, NPA told the lamp bulb makers recently, and urged them to continue all types of conservation.

Electrical distributors have asked NPA to revoke order M-86, stating that they are selling themselves out of business under its provisions for inventory replenishment of copper wire and cable.

These two Safety Switches have the same H.P. ratings when used as disconnects for AC motors.



Revolutionary New AC Motor-Circuit Safety Switches

matching motor control cases, size for size; matching performance, too

Up until now safety switches have invariably been much larger than the motor control with which they have been used. This has created difficult installation problems. Even when space was available, their bulk and weight made mounting difficult; and the much larger size of the safety switch in such close relation to an associated control enclosure has simply been all out of proportion to the latter. This detracted from the appearance of the complete installation. Cutler-Hammer engineering has ended all this as far as AC motors are concerned. The new and exclusively Cutler-Hammer Bulletin 4110 line of Horsepower Rated AC Motor-Circuit Safety Switches matches safety switch and motor control in size, convenience, and dependability. Available now in ratings from 3 H.P. to 30 H.P., 3 or 4 poles, for 230 Volts AC... and in ratings from 7½ H.P. to

50 H.P., 3 or 4 poles, for 575 Volts AC. Inspect these better switches now and see their many features. Front side operated. Quick make and break. Simple release cover-interlock. Provision for 3 padlocks in "OFF" and 1 padlock in "ON" positions. Unit pole construction. Non-welding butt type totally enclosed silver contacts. Silver plated current carrying parts. Positive-pressure type fuse clips. Solderless connectors. NEMA 1 enclosure. Complete switch assembly on panel removable for easy installation and wiring. Adequate and convenient knockouts. Cutler-Hammer quality and advanced engineering at no extra cost. These switches have no substitutes even remotely comparable. Your Cutler-Hammer Authorized Distributor can supply you. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee 1, Wisconsin.

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MAY at a Glance

Pittsburgh Construction

The rebuilding of major areas of a great city is a stupendous operation. It takes planning and long years of persistent civic effort. It takes great financial initiative and foresight. The results in Pittsburgh are beginning to show in great new buildings overshadowing once blighted areas. They are showing in space and room for greater growth. We reluctantly leave the greater Pittsburgh story for others to tell. The interests of our readers are primarily electrical. The tremendous building program offers an opportunity to witness a comprehensive case study of modern electrical construction technology from work in progress in one community. For several months our staff has been compiling data and photographs for the group of articles which comprise our entire feature section this month. We wish to acknowledge gratefully the splendid cooperation and assistance made available to us by the electrical contractors, consulting engineers, utility engineers and building owners in the gathering and preparation of our material.

Highlights

Aluminum sector bus, which we first encountered at the Alcoa plant in Davenport, Iowa, is used for the main feeders in the Alcoa office building (page 74). With busbars, cables, conduit, and panel enclosures all of aluminum, the new building is a virtual laboratory of aluminum use in electrical construction.

Pittsburgh's new airport (page 78), soon to be opened to commercial traffic, has the latest in electrical systems designed for maximum reliability. Many new control and safety features, and new lighting techniques were applied. Extensive electrical provisions are included for still greater growth.

No construction picture would be complete without a look at the facilities for maintenance. The story of electrical maintenance operation at the H. J. Heinz food processing plant gives a case study of in-plant industrial electrical maintenance practice. Supporting the vast industrial electrical system in the Pittsburgh area are a group of splendidly equipped motor repair establishments (page 91) serving 2000 plants and handling a gross annual business of \$4 million.

NISA

The annual convention of the National Industrial Service Association met last month in Chicago setting a new registration record of nearly 900 delegates and guests. The program was extended one day over previous convention schedules to allow the members to visit several of Chicago's prominent shops and to provide more time for the popular technical forum sessions. To make a close deadline, Gus Eckel prepared the convention report (page 180), without pictures. His candid photos of the convention activities will appear in the June issue. A selection from the outstanding technical papers given at the convention will also be presented here in the next few months.

DATES AHEAD

Illuminating Engineering Society—East Central Regional Conference, Webster Hall Hotel, Pittsburgh, Pa., May 22-23; Northeastern Regional Conference, Hotel Preston, Swampscott, Mass., June 19-20.

Edison Electric Institute—20th Annual Convention, Cleveland, Ohio, June 2-5.

National Association of Electrical Distributors—Annual convention, Atlantic City, N. J., June 9-13.

National Fire Protection Association—Annual meeting, Hotel Statler, New York, N. Y., June 9-13.

Illinois Chapter, International Association of Electrical Inspectors—Summer meeting, Hotel Fort Armstrong, Rock Island, Ill., June 19-20.

New York State Association of Electrical Contractors and Dealers, Inc.—Saranac Inn, Saranac, N. Y., June 29-July 7.

Illuminating Engineering Society—National Technical Conference, Edgewater Beach Hotel, Chicago, Ill., September 8-13.

International Association of Electrical Inspectors—Northwestern Section, Twin Falls, Idaho, September 11-13; Southwestern Section, California Hotel, Fresno, Calif., September 18-20; Eastern Section, Hotel Statler, Washington, D. C., October 1-3; Western Section, Hotel Hollenden, Cleveland, Ohio, October 6-8; Southern Section, Hermitage Hotel, Nashville, Tenn., October 13-15.

National Electronics Conference—8th annual conference, Sherman

Hotel, Chicago, Ill., September 29-Oct. 1.

National Electrical Contractors Association—Annual convention, Hotel Morrison, Chicago, Ill., October 5-10.

Electrical Industries Show—Sponsored by the Eastern Electrical Wholesalers Association, 165th Regiment Armory, New York, N. Y., October 14-17.

National Farm Electrification Conference—Hotel Statler, Detroit, Mich., October 20-21.

National Industrial Service Association—Southeastern Chapter meeting, Miami, Fla., Oct. 24 and 25.

National Electrical Manufacturers Association—Haddon Hall Hotel, Atlantic City, N. J., Nov. 10-13.

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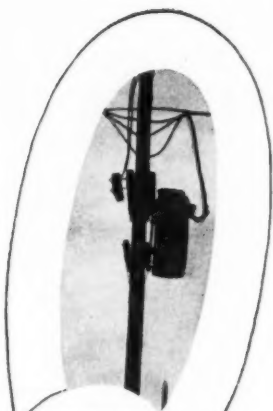
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OVERHEAD...



UNDERGROUND...



IN DUCTS

Motor Shops Grow

RECORD ATTENDANCE at the recent National Industrial Service Association convention in Chicago is symptomatic of the steady growth of one of the most progressive elements in the electrical industry. The growth of the motor shops, however, is more than a matter of numbers and general prosperity. It is soundly rooted in continually improved technology, shop practice and business methods.

SUCCESS IN THE EXACTING FIELD of industrial electrical service requires an unusually high level of technical competence and business judgment. By the nature of the market and the large responsibilities involved, business practice is conservative, rigorously reputable and geared to maintaining strong customer relations over the long period.

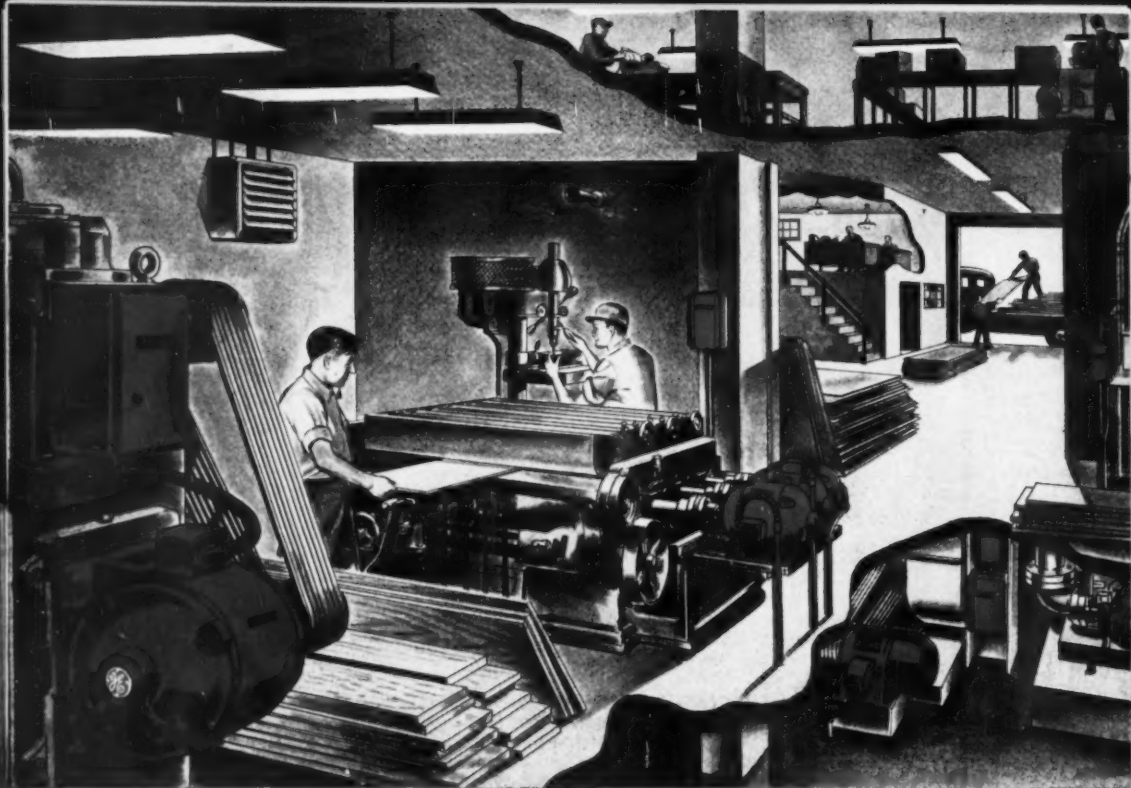
A MAJOR FACTOR in the growth and basic stability of the motor shop industry is the rapid adoption of specialized shop machinery and tools. Much of this modern equipment started from some characteristically ingenious device made to meet a shop problem. In time it is developed and marketed to the industry.

MANY OF THE GADGETS laboriously created from old machinery parts which once served to mechanize shop operations have given way to modern equipment designed and manufactured to meet the special requirements of the motor shop. New testing and balancing apparatus is far more versatile and easier to use than anything previously available.

EQUALLY IMPORTANT TO THE INDUSTRY'S GROWTH are the many new insulation materials which made it possible to meet special requirements and to solve special problems encountered in industrial applications. The shop is no longer limited to a simple rewind or repair but can deliberately modify motor characteristics to improve operations or extend serviceable life in certain applications.

THE EXCHANGE OF TECHNICAL KNOW-HOW and methods among motor shops is encouraged and fostered by NISA. The result has been a substantial gain in technical standards and shop practice at a time when the boom in industrial electrification is placing ever greater responsibility on our maintenance and repair facilities.

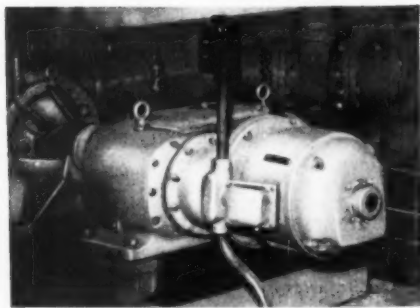
Wm. T. Stuart



POWER — WHEN AND WHERE IT'S NEEDED. Smooth, steady power for any production line begins when you install Graybar-distributed G-E motors and controls. AC or DC... general- or special-purpose, G-E Tri-Clad motors offer your

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IN OVER
100 PRINCIPAL CITIES

The PITTSBURGH STORY

Pittsburgh's giant reconstruction program provides in one community a comprehensive case study of modern electrical construction, installation and maintenance practice of nation-wide significance. New materials and methods are appearing with characteristic concern for future growth as well as present requirements.

THE story of electrical work in the Pittsburgh area has a special significance for these times. In the following pages we have brought together a selected group of articles, each bearing on one project or activity characteristic of the electrical work related to the broad plan of community development and growth. Each project is presented in sufficient detail to provide useful and practical data which may be applicable to other projects with similar electrical requirements.

Taken together, the projects present a comprehensive picture of community electrical development in practical detail and technical aspects which we believe is unique in publishing history. It is particularly fitting that the City of Pittsburgh, with its long history of civic and industrial progress, should be the focal point for such an intensive study. The resulting record is one that the entire electrical industry can share with commendable pride of achievement.

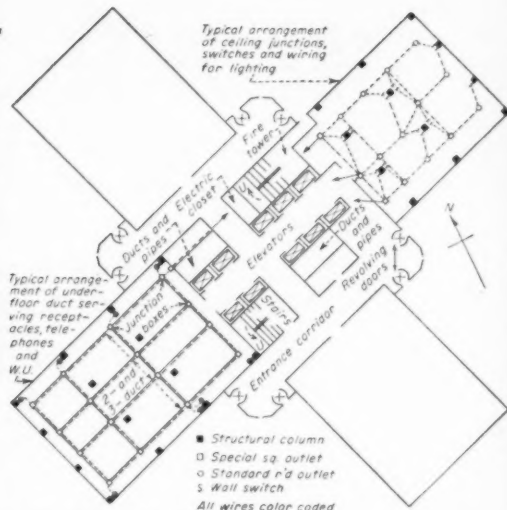
As a functionally essential part of the tremendous reconstruction job, electrical requirements have to be met on passable standards in any case. But here in one community, top quality work of many different architects, engineers and electrical contractors is going on concurrently in a broad framework of civic initiative toward community betterment.

There is one common factor in the Pittsburgh story. These are buildings designed for the future. They are part of a long-range plan of community development. They present, in a variety of materials and methods, the going standards of design and installation. Here, in effect, is a cross-section of current electrical development in the practical terms of pipe and wire.

Design for future load growth is the rule rather than the exception. In the electrical designs of the great new buildings, in industrial plants, in planned lighting application, in housing and service modernization, the record is one of substantial progress and superior standards.

Highlights of current electrical construction and maintenance design and installation in Pittsburgh.

- Hollow square ventilated copper bus
- Dual distribution
- Ring bus service
- Current limiter taps
- Aluminum conduit and cabinets
- Aluminum sector bus
- Aluminum wire and cable
- Cellular steel floor raceways
- Ignitron rectifiers for dc
- Primary voltage distribution
- Free standing transformer substations
- Centralized motor control
- Supervision through communication devices
- Luminous ceilings
- Recessed airport apron lighting
- Aluminum poles and housings for outside lighting
- Radiant heat snow removal
- Master TV antenna system
- Electrically dispatched mail handling
- Airport fire safety switching
- Photo electric conveyor control
- High intensity vehicular entrance lighting
- Mass production service modernization
- Portable power for construction tools
- Specially equipped maintenance trucks
- Demountable scaffolds
- No. 4 minimum residential services



CORE OF TYPICAL CROSS-LIKE BUILDING contains high-speed elevators, electric closets, pipe and duct risers, air conditioning equipment and motor rooms. Underfloor ducts and flexible lighting systems serve tenants occupying wings.

MODERN METAL-SHEATHED OFFICES, erected at the tip of Pittsburgh's Golden Triangle, offers maximum electrical service, comfort, light, air and beauty to Iron City industrialists.

Power and Light for GATEWAY

Progressive design of office building development located at the tip of Pittsburgh's Golden Triangle includes a 3-million CM ring bus, extensive underground facilities for building and tenant services, heating cable installations for snow removal and up-to-the-minute electrical and structural construction features.

By John R. Williams, Vice President, Lord Electric Company

ONE of the outstanding projects in Pittsburgh's gigantic rebuilding program is mammoth Gateway Center. When completed, this office development will consist of eight 20- to 24-floor buildings occupying 23 acres. Already three buildings have been completed. Tenancy begins this month.

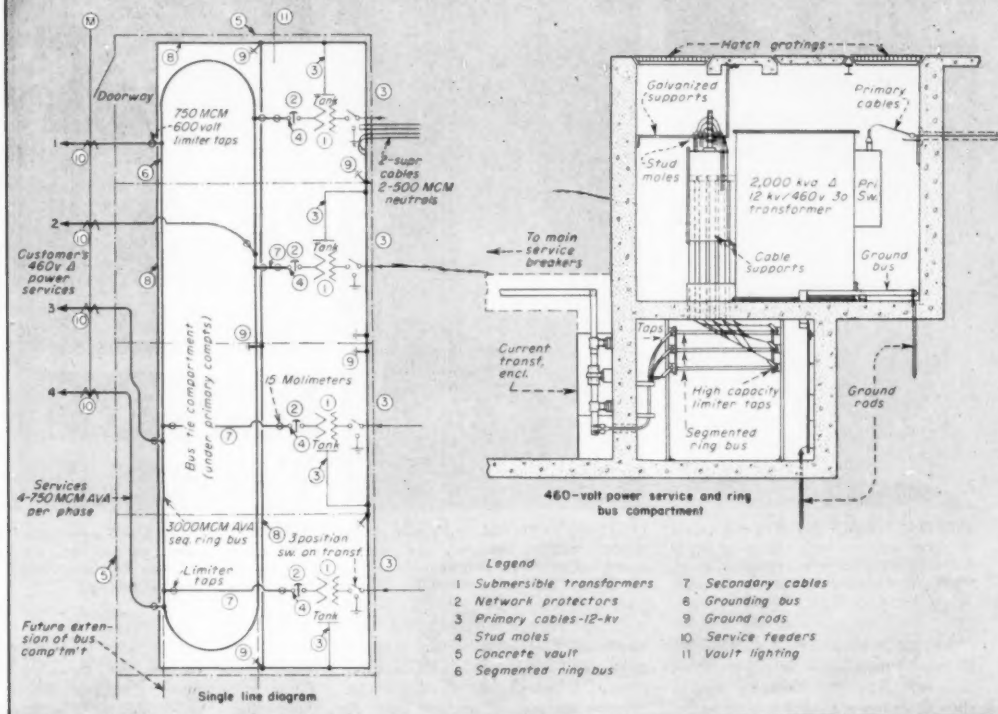
Overlooking newly-created Point Park at the intersection of the Alle-

gheny and Monongahela Rivers, the erection of Gateway Center symbolizes a new city rising from the ashes of the old. For this area, site of Fort Duquesne and birthplace of Pittsburgh in 1758, was completely leveled to make way for this new, progressive enterprise. Decayed commercial lofts and blighted industrial structures were wiped out, replaced by impressive metal-sheathed examples of modern

engineering and technical progress.

Indicative of top-drawer planning are construction and service features. Buildings are completely air conditioned. Lighting is flexible in control and designed for high quality and quantity alike. Multiple service entrances feed the electrical system, with a 3-million CM ring bus insuring power for all 440-volt equipment. Ten high-speed elevators rise through the core of each building. And 2- and 3-duct underfloor raceways provide tenant space with high- and low-potential grids.

Designed in the forms of 200-foot crosses with arms measuring 50 feet across, each structure is surrounded by at least two acres of open landscaping. And, with streets on the Point now fewer and wider than formerly, greater building set-backs, new highways to promote fast transportation for suburban commuters and ample underground parking facilities for ten-



SEGMENTED RING BUS, connected to transformer secondaries and building service feeders through 600-volt high-capacity limiter taps, insures continuity of service in event of partial failure of utility distribution system.

CENTER

ants' cars, the Gateway Center project is attracting wide attention as an outstanding office development offering maximum service, comfort, light, air and beauty.

In addition to the high-speed elevators (six express cars operated by 60-hp motors running to the roof and four 45-hp local cars serving the lower floors), the center core of each building contains shafts for all utility ducts and pipes, various motor rooms, expansion tanks and electric service closets, enclosing lighting panels, interconnection boxes, miscellaneous signal boxes and telephone wiring slots. Closets are located adjacent to fire-tower stair wells just off central elevator corridors. With all service facilities concentrated in center cores, wings are left completely unobstructed for maximum flexibility of tenant use.

From electric closets, branch circuits extend outwards to the four wings—overhead for lighting; underfloor for

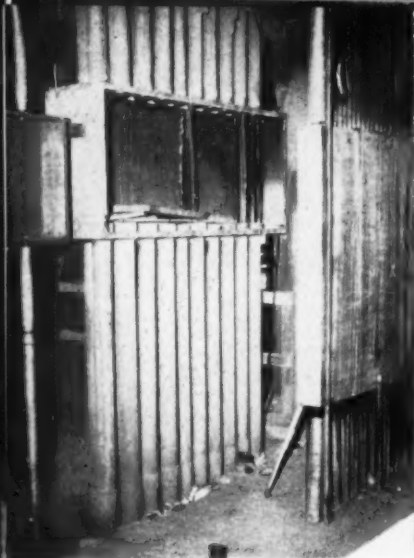
receptacles and telephone service. Conduit (galvanized and enameled) for ceiling fixtures and light switches were cast integrally with floor slabs, with pre-bent runs turning down at panel and outlet positions. To permit greater splicing space, ceiling junction boxes are special 5½-inch square 3-inch deep units, although ceiling fixture outlets are standard 4-inch octagonal. Local wall switches are single, 3- and 4-way toggles mounted on columns 4½-feet above finished floor levels, while switches controlling public halls and stair lights are key-type.

Installation Techniques

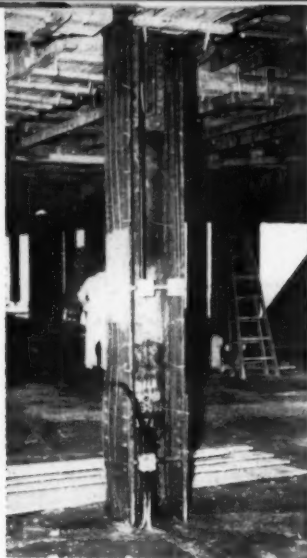
Installation methods used during the installation of branch conduits included several excellent construction short cuts. For, by using panel templates to establish exact conduit terminal points, conduits could be bent and run directly to their destinations prior to the pouring of slabs. This

largely eliminated the necessity for nipping. Also, by mass-bending the conduit for each floor as the work progressed, production time was materially lessened. And, by spot-welding outlet boxes, receptacle straps and panel supports directly to structural beams and columns, equipment was insured against shifting or dislodgment during pouring operations.

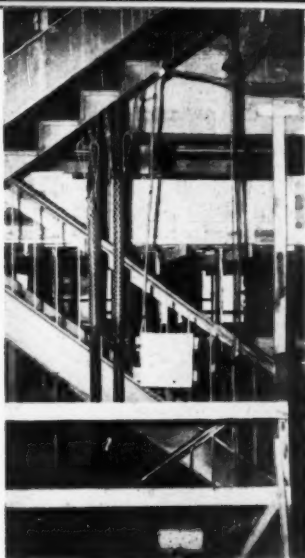
Another useful installation trick, employed during the laying of the 2- and 3-duct underfloor raceways, was in using the trade-mark on junction boxes as a positioning aid. Since the duct was a National Electric product, it was a simple matter to keep the NE trademark always in the North-East position, insuring uniformity of outlet elevations in all directions, preventing network ducts from changing elevation or over-lapping each other between junction points, and avoiding the possibility of mixing high- with the low-potential circuits.



ELECTRIC SERVICE CLOSETS give access to cable supports (left), lighting, signal and miscellaneous interconnection boxes (right); concentrate services in one area.



LIGHTING SWITCHES and power receptacles, column mounted, are rigidly supported by straps welded to structural members. Nippling is eliminated.



TEMPORARY POWER LINES were carried up stairwells during construction, supported every third floor by cable come-alongs secured to stair railings.

So that foremen would have wiring plans and installation details available for ready reference while on the job, shop drawings were cut into 18-by-24-inch sections, mounted on stiff fiberboard and sprayed with a plastic coating. These handy reference charts proved amply durable, were resistant to wear, dirt and moisture, and were used throughout the construction period.

In carrying cables up through the buildings from basements to electric closets on individual floors, conduits in riser shafts were supported at each floor level by U-clamp hangers, and cable support boxes were located approximately every four floors. The slight variation in box positions in relation to fixed floor levels resulted from the fact that only full- and half-length conduit sections were used, thereby keeping cutting of conduit and waste to a maximum. Cable support boxes are angle-reinforced steel with removable covers and wedge type cable supports.

Conduit offsets occur about every second floor, with cables shifting from main shafts to various control panels as required. For example: a conduit feeding lighting panels on floors 3 and 4 is offset just below the ceiling level of the 2nd floor, then rises directly under the two panels to be served. In a typical 24-floor building the number of power conduits in the shaft just below the first offset is 26, with diameters varying from 2½- to 4-inches. Three

additional 3½-inch conduits carry telephone and WU lines. Typical cable support boxes at the lowest point of support measure 15 inches deep, 32 inches high, 85 inches wide.

All local panelboards have minimum gutter widths of 4 inches, with top and/or bottom gutters going to 8 inches when panels contain cables larger than 250MCM. When panels measure more than 36 inches in either direction they are supported by angles running from floor to ceiling.

Balanced Loading

Branch circuits are balanced on panelboards so as to keep loading of phases within a 10% margin; each phase of each feeder and branch line being color-coded black, blue or red for positive identification in this connection process. Wire is generally type RH, although underground cables are lead covered. Smallest wire size is 12 gauge, with runs of 100 feet or more being 10 gauge as far as the first outlet. Control wiring—for connections between starters and electro-pneumatic switches, damper contacts, ventilation duct thermostats, unit heaters, flow meters, instrument boards, float switches and high-low alarms—is rubber-insulated number 14, run in conduit.

Distribution for lighting is 120/208 volts 3 phase 4 wire. For power it is 3 wire both for 208- and 440-volts. During construction each building was separately powered by one 12kv/120-

208 volt transformer, with temporary power lines carried up stairwells. These cables were supported every third floor by cable come-alongs secured to stair railings.

Underground Services

Although the various offices rise as separate structures above ground, one common basement level extends beneath and between all of the buildings, with a 4-foot blanket of landscaped parkland covering those underground areas not surmounted by metal-sheathed superstructures. As a result, the basement is sufficiently large to house such tenant conveniences as restaurants, barber shops, bank vaults and parking space, and such service facilities as transformer vaults, main switchgear, instrument panels, motor-operated dimmers for main lobby cold cathode lighting, air conditioning and refrigeration equipment, fan rooms and engineering offices. Some of the larger motors in this underground area are 1500-hp compressors (served from main switchboards by busduct), 200-hp pumps for condensed and chilled water, and 50-hp backwash pumps.

As protection against the remote possibility of future floods, utility vaults are protected by vertical feeder loops on the primary side and, also in the interest of safety, firewalls separate parking spaces from the rest of the basement sections. By landscaping the basement roof between buildings, beauty is obtained above; utility below.

Main switchboards, also located below ground, are 2-inch ebony-asbestos, fused at the rear, with renewable elements up to 600-amperes. Breakers are thermal magnetic up to 600-amperes, manually operated from 600 to 1600, and electrically controlled above 1600. Separate busses for light and power are also mounted on the rear of the boards, supported in soapstone seats.

Heating Cable

Since the roof of the engineering office is inaccessible, this section is provided with heating cable for snow removal. Thirteen circuits, each measuring 120 feet, are installed to serve this 300-sq-ft area, with circuits so positioned that 68 rows of cable are installed on 2½-inch centers. Cables are stapled to a glass fiber insulation blanket supported by a waterproof slab and covered by a waterproof cement-surfaced mat sloping towards drains. Junction boxes, raised slightly above this mat surface, are likewise waterproof.

3-Million CM Ring Bus

The three existing structures are collectively powered through three primary service entrances from the city-wide network of the Duquesne Light Company. These entrances are through 4-compartment reinforced-concrete sidewalk vaults complete with drains, ladders, concrete-filled cover gratings, galvanized cable supports, wall-mounted convenience outlets and weatherproof ceiling lights controlled from 3-way switches at entrance gratings. Vaults are fitted with primary 12,000-amp 3-phase street ties, current limiters, network protection equipment, subway network transformers, primary switches, copper bar neutral busses and ground rods, metering equipment and related current transformers segregated by Transite barriers.

Two of the entrance vaults contain four 500-kva 12kv/208-120v OISC transformers with 2000-amp main service breakers. The third point of service entry is a twin-vault installation; one vault containing four 750-kva 208/120 volt units with 2500-amp breakers, the other containing four 2000-kva 12kv/460v transformers with 3000-amp breakers. Terminals for all secondary transformer connections are supported independently from transformers so as to permit the removal of transformers without disconnecting leads.

Beneath the 460v vault, a bus tie compartment contains the segmented 3-million CM ring bus, with 15-

750MCM AVL secondary cables descending from each of the four transformers to the ring via 3000-amp subway network protectors and stud mole connectors (Burndy Molimitters). The three 3-million CM AVC cables forming the ring are supported by ebony-asbestos blocks bolted to free-standing floor-to-ceiling galvanized channels. Connections of transformer secondaries and building service feeders are through 600v high-capacity limiters.

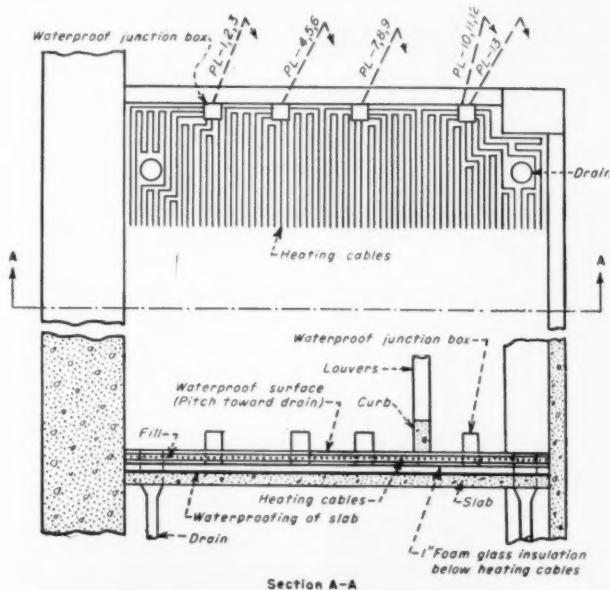
Four services run to each of the three 120/208v switchboards in Gateway Center; each service consisting of either six or seven sets of 3 single-conductor 500MCM phase cables, with a bare 4/0 neutral in each of six conduits. Four services also extend to the single 440v 3-phase delta switchboard that controls all 440v equipment in the Center; each service consisting of four 750MCM cables per phase.

Manufacturers supplying major items of equipment for Gateway Center's electrical distribution system included Westinghouse (panelboards, breaker-type switchgear, 440-volt busduct and some of the lighting fixtures), Spang-Chalfant Division of National Supply (conduit and fittings), Habirshaw Cable and Wire Division of Phelps Dodge Copper

Products (cable), National Electric Products (underfloor duct), Federal Electric Products, Trumbull Electric Manufacturing and Bull Dog (safety switches), The Miller Company (lighting fixtures), Edwards (push-buttons and low-tension gongs), Steel City Electric (outlet boxes), Bryant Electric (receptacles and local switches) and Russell and Stoll (marine outlets).

Credit for the electrical installation goes to the Lord Electric Company; specifically to vice president Robert Pierce, project manager O. E. Carlisle and job foreman Howard Johnston. Electrical and mechanical engineers were Meyer, Strong and Jones. The architects were the firms of Irwin Clavan and Eggers and Higgins. Builders were Starrett Brothers and Eken. Substations and ring bus structure were designed by Duquesne Light Company's engineering staff.

Gateway Center, a project of the Equitable Life Assurance Society of the United States, is an excellent example of investment funds at work with a double purpose. For the Center provides more office elbow room and it lends lustre to the gleaming tip of Pittsburgh's refurbished Golden Triangle.



Section A-A

HEATING CABLE, for removal of snow in inaccessible air- and light-wells, is stapled to glass-fibre insulating blanket supported and covered by waterproof slabs. Junction boxes are raised slightly above slabs which are properly sloped toward drains.



FIVE TWENTY-FIVE WILLIAM PENN PLACE—a striking combination of stainless steel and limestone construction.



BOARD ROOM LOBBY has fluorescent cove-type coffers and incandescent spots mounted flush in embossed, stainless steel acoustic ceiling.

Mellon-U. S. Steel Office Building

Two separate, self-contained secondary networks on 11 kv primary service combine with cellular steel floor raceways to provide flexible electrical distribution for new 41-story office building.

By **W. N. McDermott**, *The Howard P. Foley Company, Pittsburgh, Pa.*

TALLEST of the new office buildings recently constructed in Pittsburgh's one and one-half billion dollar civic, commercial and industrial expansion program, is the 41-story 525 William Penn Place Building. This impressive structure, in the heart of the city's commercial district, has strikingly simple exterior lines incorporating stainless steel window-and-spandrel assemblies which rise in unbroken columns between continuous pilasters of gray-hued limestone edged with stainless steel fins. Throughout the building interior, the architects have applied stainless steel to both functional and decorative designs.

Three tenants occupy the entire structure. The United States Steel Corporation leases 30 floors and the lowest basement; the Mellon National

Bank and Trust Company, eight floors and two basements. T. Mellon & Sons, investment bankers, occupy the 39th floor.

Primary Service

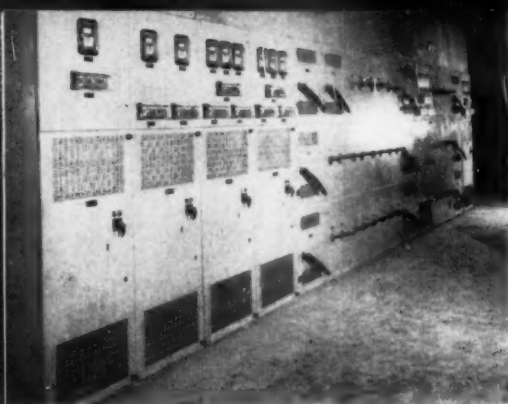
A substantial block of power serves the electrical requirements of this completely air conditioned building (13½ million cubic feet of space). At present, 9,000 kva of transformer capacity is installed with space provisions for the addition of another 2,000 kva. Electrical distribution facilities are located at the heaviest load concentrations (air conditioning, ventilating, water heating and cooling, etc.) in the basement and 32nd floor mechanical areas.

Just outside the building line is a six-compartment underground vault of the Duquesne Light Company.

Each compartment (with the exception of one for future use) contains a 1,000 kva, 11,000-120/208-volt, 3-phase, oil-cooled transformer equipped with primary switch and secondary network protector. Each transformer serves one "division" of the basement main secondary switchboard.

One large transformer room on the 32nd floor contains four 1,000 kva, 11,000-120/208-volt, 3-phase, air-cooled transformers similarly equipped. Space is provided for the addition of another unit. In adjacent rooms are two secondary switchboards, each with two "divisions". Each board is fed by two transformers.

Five 11-kv feeders from the utility primary network provide service to the building. Each feeder serves one transformer in the basement vault. Four of these 3-conductor, No. 1/0,



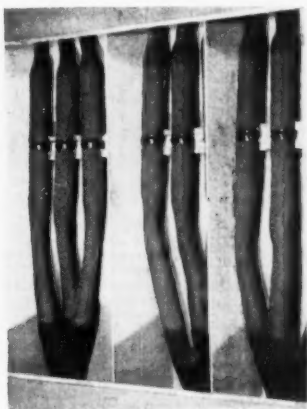
MAIN SWITCHBOARD in basement is fed by five 1,000-kva transformers; has six main divisions with associated feeder breakers.



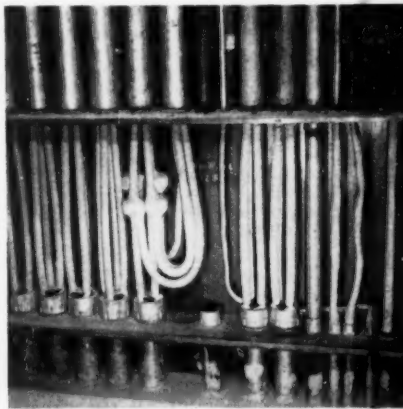
AIR-COOLED TRANSFORMERS for 32nd floor network (total of four 1,000-kva units). At right is 11-kv service; center, network bus; left, secondary feeders to switchboard.



MAIN FLOOR LOBBY of building is finished in stainless steel and illuminated by 200-watt hi-hat units in ceiling.



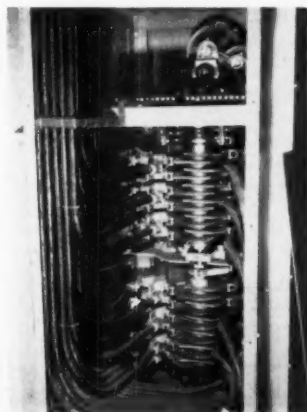
SPLICE CABINET on 32nd floor showing four 3-conductor 11-kv risers spliced to single-conductor cables.



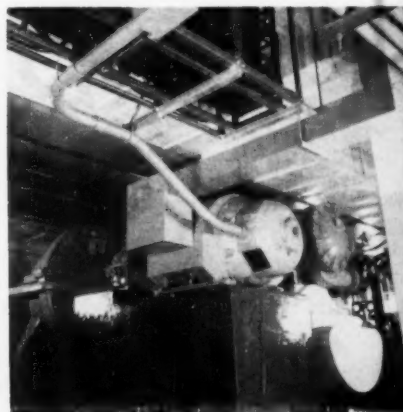
TYPICAL CABLE SUPPORT BOX in riser shaft on every fourth floor. Cable fire-proofing uses asbestos tape wrap.



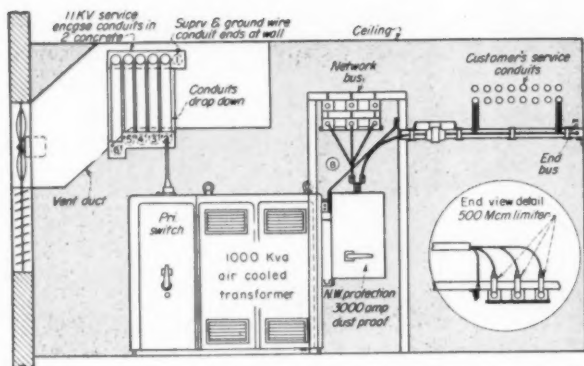
HEADER DUCTS carry electric, signal and communication branch circuits from electric room panels to Q-floor cells.



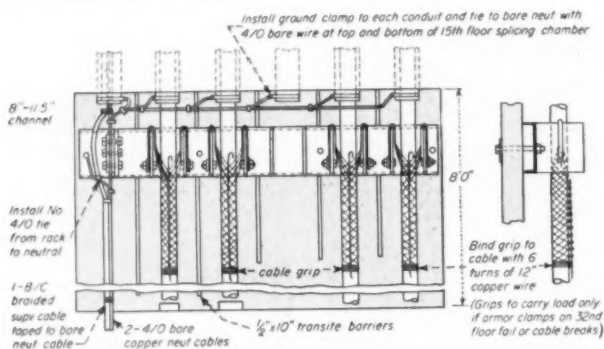
CAM CONTROLLER for 800 hp compressor motor. Interior shows careful training of 400MCM AVA cables.



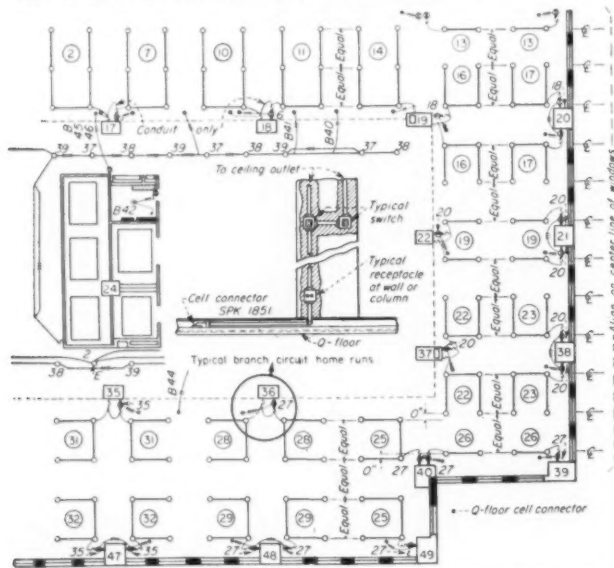
CONDUCTORS FOR 800 HP air compressor motor carried in troughs from breaker, resistors and cam controller.



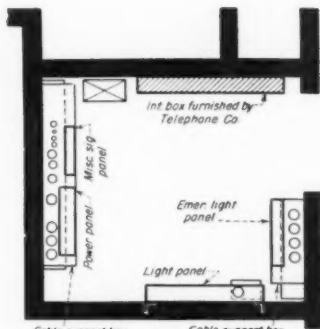
SECTIONAL VIEW of 32nd floor transformer room showing primary, network and secondary service connections.



CABLE GRIP METHOD of supporting 11-kv. feeders in special cabinet on 15th floor. Armor clamps were used to support cables on 32nd floor.



BRANCH CIRCUIT LAYOUT on typical floor showing detail of lighting and receptacle circuit connection to Q-floor cells.



Cable support box to be mounted at 16in, 20in, 24in, 28in & 32nd fls.

PLAN OF TYPICAL ELECTRIC CLOSET over riser shafts (two per floor)

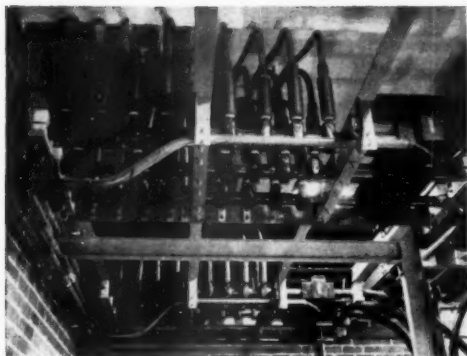
11-kv. cables continue to the 32nd floor to serve the transformers there.

Six 4-inch steel conduits, encased in a concrete envelope, carry the primary cables from the basement vault to the upper transformer room. Splicing and cable support facilities are provided by large roomy cabinets in the basement, on the 15th and 32nd floors. Four conduits carry the service feeders; the fifth has the 8-conductor supervisory cable plus two No. 4/0 bare copper neutrals; the sixth is a spare for future use.

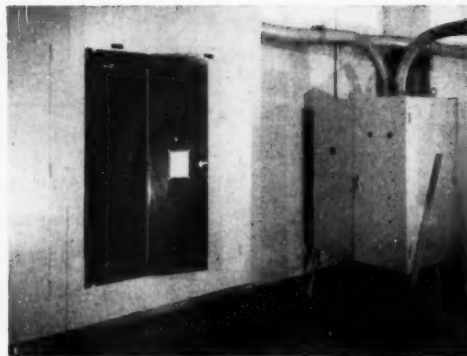
Ring Bus Forms Network

Service continuity on the 120/208-volt, 3-phase, 4-wire distribution is assured by two separate, self-contained network systems. The first originates in the basement and serves the basements and first 13 floors. The second, on the 32nd floor, serves the remaining floors. There is no secondary connection between the two systems.

The networks are formed by a ring (one 3,000MCM AVA segmental cable per phase) at each group of transformers. In the basement, this bus is mounted on wall brackets around the interior of an 8-ft. by 18-ft. room between the transformer vault and the main switchboard. Six 500-MCM cables per phase go in parallel conduits from one set of mole-type studs on the transformer network protector to the ring and are connected to the bus cable with limiter taps. A copper bus ring ties together the neutrals. There are a total of 108 secondary taps on the three phases of the ring bus. From the other set of network protector studs a secondary service goes to one "division" of the main switchboard. Each service consists of six 500MCM AVA cables per



LIMITER TAPS connect switchboard cables to transformer secondary. Eight 500MCM cables per phase are tapped.



TYPICAL POWER DISTRIBUTION panel in a basement equipment room. Circuit breakers protect branch circuits.

phase leg plus two 500MCM bare copper neutrals in each of three fibre conduits.

A similar type and size of network bus is installed directly above the four transformers on the 32nd floor. The use of 3,000MCM segmental cable ties between the dual network protector terminals and the ring bus and the secondary switchboard services simplified connections at the transformers. Eight 500MCM cables per phase are connected with limiter taps to the segmental cable service tie. Sixteen 4-inch conduits, each with four 500MCM cables, feed each switchboard (two transformers per board).

Secondary Distribution

Secondary distribution for the entire building originates at the three main switchboards and their associated transformers. The basement board has six main "divisions"; the two boards on the 32nd floor each have two divisions. Each division consists of a main circuit breaker (3,000-ampere) with its associated secondary feeder breakers; is, in effect, fed by a separate transformer.

The 120/208-volt feeders from the switchboards to individual floors consist of groups of parallel 3½-inch conduits, each containing four 500MCM cables; are divided into two sets of risers which extend vertically in two shafts at opposite ends of the mechanical service area (elevators, air conditioning, heating and piping ducts, etc.) in the center of the building. Electric rooms at shaft locations on each floor contain the lighting, power, signal and telephone distribution panels and cabinets. Cable support boxes are installed on every fourth floor.

In general, one lighting feeder serves distribution panels on three floors. For example: Lighting feeder No. 2 serves panels in the "A" shaft on the 3rd, 4th and 5th floors. Lighting feeder No. 14 goes to panels in the "B" shaft on these same floors. "A" panels on the 6th, 7th and 8th floors are connected to feeder No. 3, etc.

Power feeders do not follow this pattern. Due to variance in load on each floor, one feeder may serve three or more floors with sub-distribution panels spotted throughout the area as required. While secondary power is normally 208-volts, 3-phase, the feeders carry the neutral conductor, as a general rule. Thus, 110-volt service is available at the power panels if additional capacity should be needed at some future date.

An emergency lighting feeder serves a panel on each floor from the third basement to the second penthouse; is tapped off a secondary service feeder ahead of the main switchboard in the basement.

Q-Floor Branch Circuits

Extensive use of cellular steel flooring permits 525 William Penn Place to have one of the highest branch circuit flexibility ratings among modern commercial buildings. All high tension (110-volt) and low tension (signaling and communication) circuits are carried in the floor cells.

Header ducts carry branch circuit conductors from the electric room distribution panels to the floor cells. Other lateral header ducts, extending from one building wall to the other, form a basic grid for additional distribution flexibility.

Contrary to normal procedure (ceiling circuits with switch leg drops),

lighting circuits in this building are pulled in the Q-floor cells with switch leg risers going up walls and columns to conduit jumpers between ceiling boxes.

Mass Production Methods

To conserve time and keep well ahead of the lathers and plasterers, mass production methods were applied to ceiling outlet work. Branch circuit conduit (rigid, ½-in. minimum size) was delivered to the job in 25,000-foot lots. From 5,000 to 6,000 feet of pre-cut conduit was delivered to each floor well in advance of installation.

Header duct runs were ordered according to individual floor requirements and delivered to the proper floor immediately upon receipt.

Practically all conduit offsets to ceiling outlets were eliminated by using deep octagonal boxes equipped with dual sliding support bars and two tiers of knockouts.

Feeder cables were pulled either up or down the riser shafts depending upon the reel and winch setup facilities available at the respective floors.

Two months of valuable time were gained by having the basement switchboard overhead pull box delivered first. By the time the cubicles arrived, all feeder conduits and cables were installed.

The electrical installation was made by The H. P. Foley Company, Pittsburgh, for the owners, 525 William Penn Place Corporation, President John W. Galbreath. Associate architects were W. K. Harrison, Max Abramovitz, both of New York City and W. Y. Cocken, Pittsburgh. The consulting engineers were Meyer, Strong & Jones, New York City and general contractor was Turner Construction Company, New York City.

Wiring PITTSBURGH'S

The Aluminum Company of America's 30-floor skyscraper featuring sector bus distribution of power, dual wiring systems, automatic emergency transfer switches, radiant heating and the extensive use of aluminum as a practical electrical and structural medium—combines progressive engineering with new materials and construction methods.

By Edward E. Ashley, Consulting Engineer, New York, N. Y.

PITTSBURGH'S renaissance—impressive in scope, tempo and progressive vision—is nowhere evidenced more effectively than in the ultra modern design of ALCOA's smart new skyscraper headquarters. This 30-floor metal-sheathed structure is a gleaming new landmark. But, more significantly, it forcefully demonstrates the advantages of aluminum as a practical building and electrical element. Backed by nine years of study and experimentation, the building incorporates numerous engineering innovations, constituting in fact a giant showcase in which are displayed wide varieties of aluminum products in useful service.

Appreciating the great weight differential between aluminum and either copper or steel, and exploiting the favorable strength and electrical conductivity of the lighter metal, designers used aluminum extensively throughout the building to reduce tonnage, efficiently transmit power and facilitate shipping, handling, storage and installation of equipment. Subsequently, due to post-design limitations on critically-required metals, much originally-specified aluminum had to be replaced by substitute materials. Yet, even with such curtailments, this 410-foot-high building remains a symbolically-fitting home-office for the world's largest producer of aluminum.

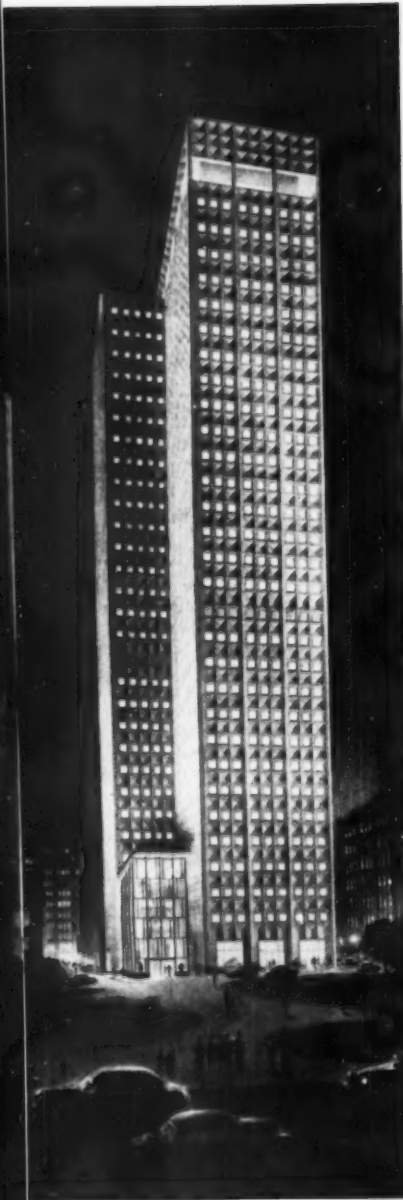
Electrically, aluminum is used for all wire and cables, conduit and raceways, busduct and vertical sector bus, junction boxes, switchplates, fittings and covers, lugs and connectors, switchgear, breaker cabinets and panelboards; also many of the lighting fixtures, supports and hangers.

Aluminum likewise figures prominently in the heating, cooling and air conditioning systems, all of which are incorporated in the ceilings. Basically, ceilings consist of aluminum panels, perforated for acoustical purposes, clipped to the underside of closely-spaced aluminum tubing through which is circulated hot water in the winter, cold water in the summer. Above the water tubing is a $\frac{1}{2}$ -inch blanket of glass fibre which serves as a sound-absorbing medium. This radiant ceiling system, thermostatically controlled, satisfies winter heating demands and, backed by a 1200-ton refrigeration plant, carries half the summer cooling load as well. Cooling requirements above the radiant system's capacity, plus air for ventilation, are furnished by primary fans located at basement, 14th floor and penthouse levels, with local fan rooms and mixing units on each floor. Aluminum ducts located above hung ceilings carry air to ceiling diffusers, while the open spaces above the perforated panels serve as plenum chambers for return air.

Since ceilings include continuous troffers extending from interior corridors to exterior walls on 6- and 7-foot centers and since lighting fixtures, air diffuser outlets and filler pieces can be installed in these troffers as desired, a flexible lighting plan is obtained whereby individual fixtures can easily be shifted to functionally and geometrically conform with a wide variety of office space arrangements.

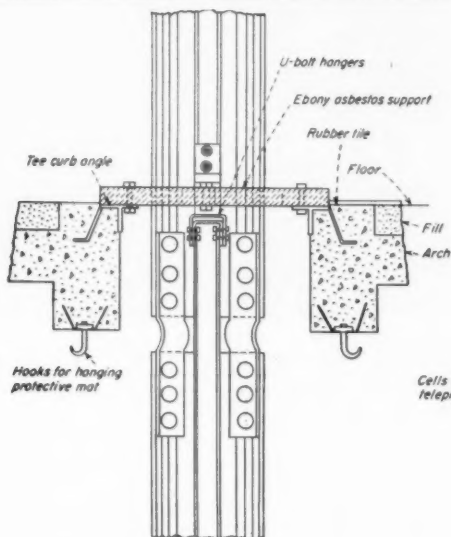
Flexible Wiring Facilities

Besides incorporating these facilities for sound absorption, heating, cooling, air conditioning and lighting, the

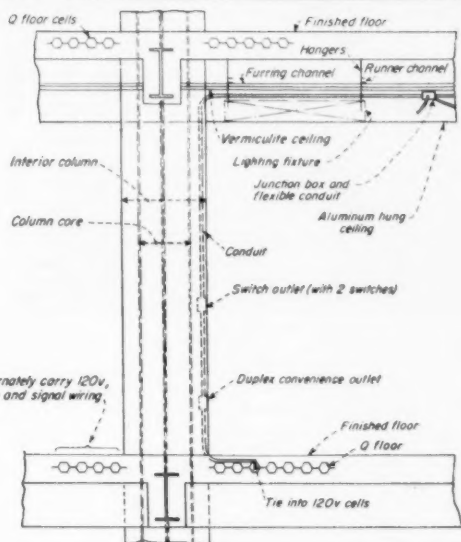


ALCOA'S NEW HOME OFFICE, sheathed in aluminum for its 30 floors, is electrically served by vertical sector busses, dual power and lighting systems, radiant sidewalk heating, TV coaxial distribution and many progressive applications for aluminum wiring.

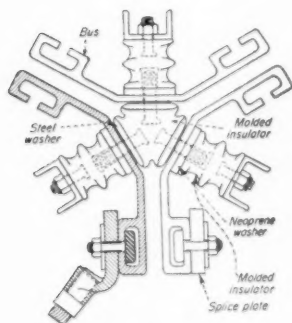
ALUMINUM SKYSCRAPER



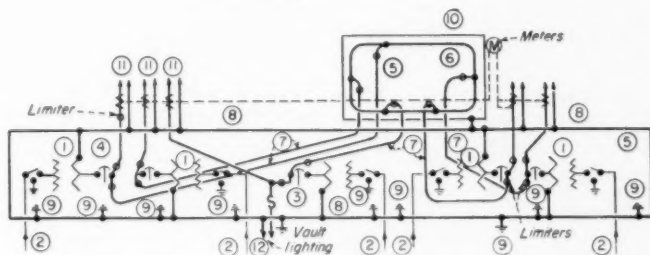
EBNY ASBESTOS SUPPORTS at each floor level hold sector bus sections and serve as fire-stops. Expansion joints are installed between each 12-foot section. Hooks in ceiling beams support protective rubber sheets.



SUSPENDED ALUMINUM CEILING combines facilities for lighting, heating, ventilation, cooling, sound absorption, piping and wiring. Wiring flexibility is also obtained through use of cellular flooring.



VERTICAL SECTOR BUS has continuous 4000-amp current-carrying capacity and 100,000-amp short-circuit resistance. Each phase bus has cross-section of 8 square inches. Neutral channels are a component part of each assembly.



LEGEND

- | | | |
|-----------------------|----------------------------------|-----------------------------|
| 1 Network transformer | 5 Transformer and bus tie vaults | 9 Ground rods |
| 2 Primary feeder-12kv | 6 Segmented ring bus | 10 Aluminum grounding bus |
| 3 Network protectors | 7 Aluminum secondary cables | 11 Customer service feeders |
| 4 Limiters | 8 Neutral bus loop | 12 Vault lighting |

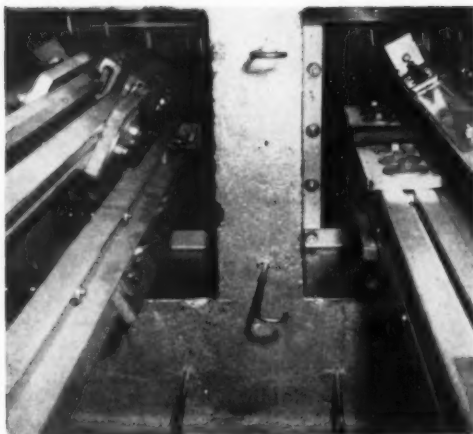
TRANSFORMER AND RING BUS COMPARTMENTS contain four 1000-kva 12kv/208-120-volt transformers, a 3-million-CM segmented aluminum ring, extensive grounding system, network protectors and limiters.

suspended aluminum ceilings enclose general piping and electrical conduit. Combining these overhead wireways with the wiring facilities of the cellular Q-floor results in an installation whereby receptacles and floor outlets for 120-volt and low-potential service

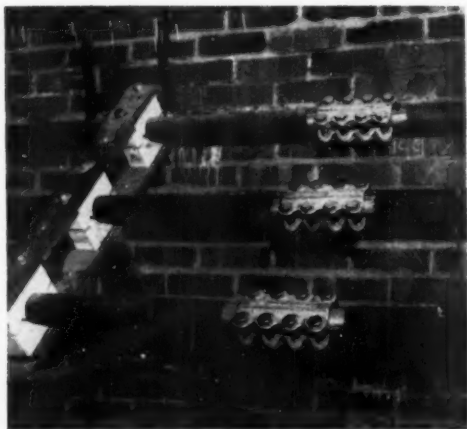
are readily served. To provide maximum wiring flexibility, cellular floors have a total of 1800 floor taps for 110-volt outlets and 1000 additional taps for low tension service. Suitable identification markers indicate the Q-floor cells carrying the three main

systems (120-volt, telephone, signal).

The use of aluminum is also advantageously demonstrated as a structural element. For example; over 3500 tons of structural steel were saved by sheathing the building with thin, weathertight, diamond-patterned alu-



LOOKING UPWARDS from position between the two sector busses, one sees method of supporting phase and neutral channels, the arrangement of expansion joints and location of hooks from which rubber blankets are suspended when either sector is to be isolated from the other.



3000 MCM RING BUS CABLES are supported by aluminum brackets, galvanized after all drilling, bending and welding has been completed. Cleat insulators are separated from each other by aluminum spacers and held in place by bent aluminum bars and bolts.

minum panels—resulting in lighter, less expensive structural beams and foundations. Installation of these lighter panels was accomplished by bolting them to vertical angles attached to spandrel beams—resulting in the abolition of erection scaffolding and permitting workmen to secure the walls from the inside. Since panels are treated to withstand oxidation and discoloration, no exterior maintenance, calking or painting is anticipated above the lobby floor.

Vertical Sector Bus

Power and office lighting for upper floors is carried through the core of the building by means of two vertical 4000-amp low-reactance sector busses, each phase bus having a cross sectional area of 8 square inches. Designed for heavy current 3-phase power distribution with minimum voltage drop, bus structures consist of extruded aluminum conductors capable of carrying 4000 amps continuously with less than a 2½-volt drop between basement switchboard and penthouse panels. Neutral conductors, consisting of three 4-inch aluminum channels having current carrying capacities equal to 70% of phase conductors, are attached to and are a component part of each sector bus. Neutral and phase taps are provided for each lighting and power panels.

The vertical bus is constructed in single-floor sections, independently supported by heavy masonite die stock slabs fitted around the bus at each floor level. Masonite slabs also serve

as fire stops, and since the two sector busses are enclosed in a fireproof shell at all elevations, protection is insured for the entire rise through the building. Laminated expansion connectors join individual bus sections together, while guide supports at each ceiling line maintain busses in proper alignment. Busses are designed to withstand thermal and mechanical stresses caused by short circuits having impacts up to 100,000 amps.

Although the two sector busses rise through the same series of fireproof compartments, provision has been made to isolate either bus from the other while men are working on them. This protection is provided by a heavy fabric-lined sheet-rubber curtain, 8 feet in width and reaching from floor to ceiling. Hooks are positioned around each bus at the ceiling line so that curtains can be easily suspended and wrapped around either bus as desired.

Electric closets are located adjacent to sector bus compartments, with connections between busses and panels carried through aluminum raceways.

Dual Distribution

For general lighting of offices and distribution to floor and wall receptacles, all panels are two-section units served by separate sector busses. Panels are wired so that each floor is served by two sources of power, providing continuity of electrical service in the event of a partial outage. This protective thinking is likewise carried to elevator motor rooms so

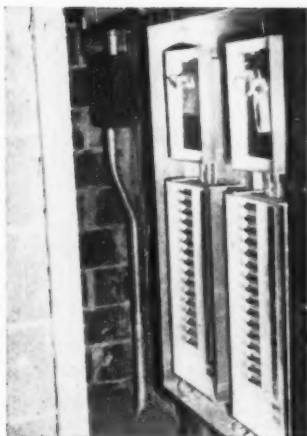
that alternate cars are powered by different sources of power, and air conditioning equipment is similarly staggered so that consecutive floors are not served from the same power riser.

All wiring is color coded, with phase legs of various services similarly colored from service switches through sector busses and local floor panels to receptacles and fixture outlets. Neutral wires are white throughout the building but as many as eight colors are used to properly identify the various services. Both feeders and mains are tagged in pull boxes and in gutter spaces of panels, with feeder identification and polarity plainly stamped on linen. Branch circuits are balanced on panel busses to keep loading of phases within 7½%.

Wire is insulated aluminum throughout the building, with two types of 600-volt insulation generally used: an oil base compound with neoprene jacket for damp locations, and a mineral base type RH wire with flame resistant waterproof braid jacket for dry locations. Due to the lightness of aluminum (specific gravity of 2.7 compared with copper's 8.89) wire pulling operations effected major savings in both effort and time.

Emergency Service

Automatic transfer switches, designed to swing emergency requirements to the independent 2-source supply in the event of normal power failure, are incorporated in the assembly of the main basement switchboard.



2-SECTION LIGHTING PANELS are served by separate sector busses, while dual system of distribution insures continuity of lighting and receptacle power in all office and service areas.

This board is floor-mounted, free standing, dead front safety type equipped with transfer circuit breakers. Constructed of structural aluminum, the board is topped by a full-plan pull box through an asbestos board barrier to the respective switch studs. All busses are aluminum with connections bolted. Laminations are interlaced to secure maximum contact area. Carrying capacities of busses are based on 500 amps per sq. in.

The board is divided into three sections, one section supplying miscellaneous power and lighting, the other two sections supplying critical lighting and power from the normal emergency services. Each of the three switchboard sections has its own metal-enclosed drawout 4000-amp air circuit breaker, with red and green pilot lights on the front of the panels to signify when breakers are closed or open. Warning bells are also installed to announce breaker openings. Two similar breakers are installed in conjunction with the two vertical sector busses that bypass the main switchboard. Removable elements of breakers are 3-pole units with dual magnetic over-current series-connected integral tripping devices. All circuit breakers are connected to the automatic supervisory control system to announce breaker operation.

Bus ducts, between service breakers and switchboard and upper floor extensions of the sector busses, have less than 1-volt drops for their entire length. Bus installations incorporate

compression type bolting devices, expansion joints, and Transite firestops at all walls, floors and partition lines.

Primary power is supplied to the building through four 1000 kva self-contained subway type 11kv/208-120-volt network transformers located in sidewalk vaults fitted with necessary network protectors, current limiters, neutral bus loop and grounding system. Immediately adjacent is a 3-million-CM segmented aluminum ring bus.

Pressurized and Welded Terminals

Connections of wire, cable and busses throughout the structure are effected either by pressure devices or by welding. Compression terminals were made by first removing the insulation on the cable, then inserting the stripped conductor into a compound-filled aluminum lug barrel, compressing the lug with a special die, wiping off the excess compound, and taping. Compression of dies was accomplished by a hand-plier device for No. 10 wires and smaller, by a bolt-cutting type of tool for wires ranging between Nos. 8 and 2, by a hand-operated hydraulic device for 1/0 to 4/0 sizes, and by a foot-operated hydraulic pump for cables of 350MCM or larger.

Wherever possible and practical, terminal lugs were welded to the aluminum cables. This was accomplished by removing approximately 2 inches of insulation, sawing the cable end square with the aid of a ferrule guide, removing the ferrule, splitting the insulation and rolling it back for another 4 inches, cleaning the cable with carbon tetrachloride, inserting the cable end into a lug collar and welding. After completing the weld, the insulation was rerolled into position and secured with a double layer of half-lapped Scotch electrical tape.

Vertical transportation of tenants is by means of 14 high-speed aluminum elevators, eight 90-hp 1000-ft-per-minute 2500-pound high-rise cars serving floors 15 to 30, and six 60-hp 800-ft-per-minute 3500-pound cars serving the lower half of the building.

Radiant Heating

Part of the lobby, as well as the surrounding exterior sidewalks, are provided with radiant heating coils. By this means, snow and ice are melted on outside walkways, and water tracked into the lobby by pedestrians is quickly evaporated; thereby the hazard of slipping is eliminated.

The 60-foot-high entrance section of the building is a unique structure for

it is suspended from two cantilever beams projecting outwards from the central structure for a distance of 32 feet at the 5th floor level. From these beams, aluminum-covered steel hangers are suspended, holding huge sections of double-glazed green-tinted plate glass. Cleaning these large glass areas is facilitated by an electric cab-carrying hoist operating from ornamental monorails located along the upper edges of the windows.

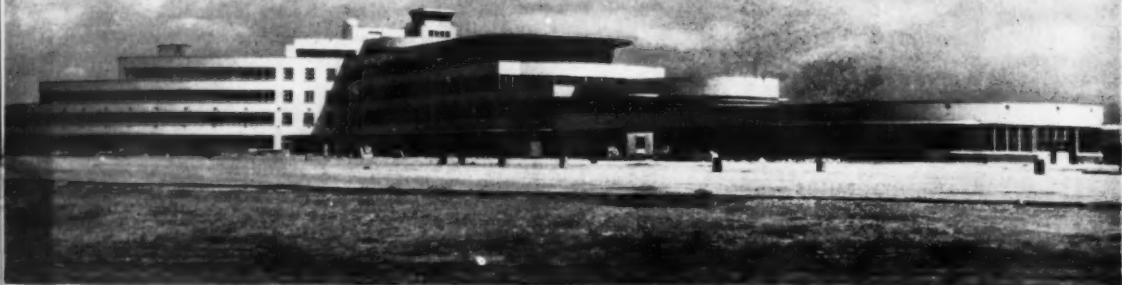
So that tenants may receive high fidelity television, FM and AM radio programs, the ALCOA building is equipped with a master antenna system that amplifies and distributes standard telecasts and broadcasts to 50 separate outlets through a coaxial net.

Manufacturers supplying major items of electrical equipment included Pelham Electric (switchboards), ITE Circuit Breaker (sector bus, flat bars and breakers), Metropolitan and Pringle (disconnect switches), Sorgel (step-up transformers), Aluminum Company of America (conduit), General Electric (cellular floor taps and fluorescent lamp ballasts), H. H. Robertson (Q-flooring), Okonite and U. S. Rubber (wire and cables), Burndy (terminals and joint compound), Harvey Hubbell (receptacles and wall switches), Gaynor (switch plates), Steel City (junction boxes), Allis-Chalmers, Century and Hoover (motors), Westinghouse (motors, starters and elevators), Columbia, Eastern Fixture, Gotham and Edwin F. Guth (lighting fixtures), Broadway Maintenance (cold cathode lighting), Holophane (fixture lenses), International Business Machines (electronic clocks) and Radio Corporation of America (TV antenna system).

This impressive modern skyscraper, featuring sector bus distribution of power, dual wiring systems for electric continuity, automatic transfer switches for emergency service, flexible wiring facilities and ceiling panels combining provisions for light, heat and air conditioning, represents engineering of the highest order. And with this basically sound engineering coupled with the extensive use of aluminum as a lightweight, versatile and dependable electrical medium, the ALCOA building truly is a showplace wherein new methods and techniques are presented for serious study.

Architecturally designed by Harrison and Abramovitz, the building was constructed by George A. Fuller. The electrical installation was by contractors Fischback and Moore. All contracting companies cooperated with ALCOA's engineering department.

Power and Light for GREATER PITTSBURGH AIRPORT



Electrical system in Pittsburgh's new airport, the nation's finest, was designed for maximum reliability. It incorporates new control and safety features, new lighting techniques, and provisions for future growth.

By James Paul Warner, P.E., Consulting Electrical Engineer, Pittsburgh, Pennsylvania

THE electrical system for the Greater Pittsburgh Airport, Allegheny County's new Gateway to the World for this growing industrial area, was designed to adequately serve both present and future needs for electrical energy requirements. It features reliability, safety, flexibility and adequacy. It cost nearly \$2-million, was installed by five electrical contractors under 19 separate electrical contracts.

The new airport cost approximately \$32-million, is owned by Allegheny County, Pa., and operated by the County Department of Aviation under direction of the County Board of Commissioners. It covers over 1600 acres, is exceeded in size only by Idlewild International Airport, Long Island N. Y., and boasts the world's largest and most sumptuous terminal building. It is located in the Pennsylvania hills 14 miles west of downtown Pittsburgh, and will be accessible over a new limited-access four-lane high speed Airport Parkway now under construction. Travel time by limousine or auto will

be about 20 minutes between the airport terminal and downtown Pittsburgh. The new airport now serves the U. S. Air Force and the Pennsylvania Air National Guard, will also soon be occupied by commercial airlines now using the old airport.

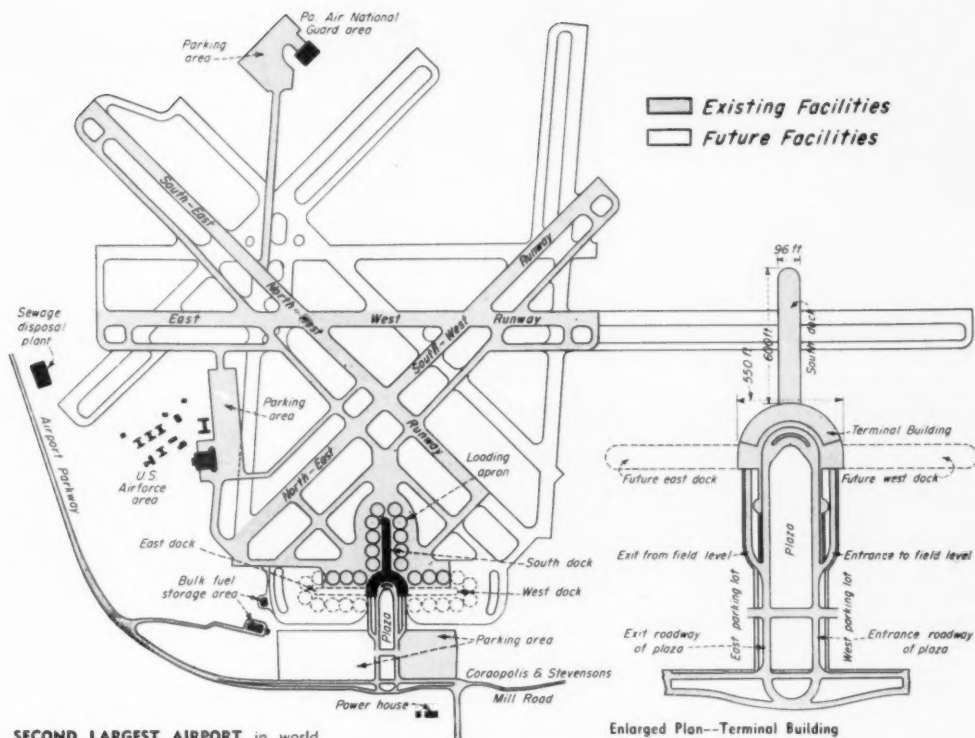
Before design of the electrical system for the new airport was begun, exhaustive research and study of electrical systems and requirements of other large airports was made. These included safety developments by the Armed Air Forces during and since World War II, to determine if these were applicable to commercial aviation. They also included Civil Aeronautics Authority regulations and practices, and electrical load requirements for the existing systems of landing aids and for possible new systems which may be adopted by CAA, the Air Force, or commercial aviation lines in the future. In addition, consideration was given to electrical requirements which may be brought about through expansion of the new airport

facilities, and through the expanded use of electric power in future aviation. Results of these studies were then used as a guide in the design of the electrical system finally adopted.

Electrical Demands

Power reliability was considered a major factor in the design of the electrical system. Power outages could not be tolerated. Thus it was decided to adopt a dual service system, so that any end use utilization device at any location could be served by energy from either of two separate sources of power.

Maximum simultaneous electrical demands were estimated (see page 80) in order to arrive at total kva connected load and total kva transformer capacity. Power loads were divided according to location to permit use of load center distribution, or unit substations which could be served at an intermediate primary distribution voltage and transformed to utilization voltages at these substations. Then



SECOND LARGEST AIRPORT in world boasts largest and most sumptuous Terminal Building, with modern electrical system designed to meet expanding future growth of both.

immediate and ultimate kilowatt demands were estimated for these individual power loads for both winter and summer. Transformer capacities for unit substations and for the main transformers serving the entire airport were then computed, using an appropriate diversity factor for each individual load. This study revealed that two 3750-kva transformers would provide adequate power for present needs, and that two 5000-kva transformers would take care of all estimated future requirements. Transformers selected and installed are therefore 3750-kva size, with provision for increasing capacity to 5000-kva by means of forced ventilation cooling.

Primary Distribution

Power is supplied to the airport over two separate services, each from a different substation of the local electric utility company. This power is transmitted at 23,000-volts. Each service uses a 3750-kva transformer bank which changes this energy to

4160-volts, 3-phase, 4-wire. Energy is used from the two services simultaneously, with the tie breaker open for normal operation. Differential relays will open either main breaker in the event of a transformer fault, and close the tie breaker.

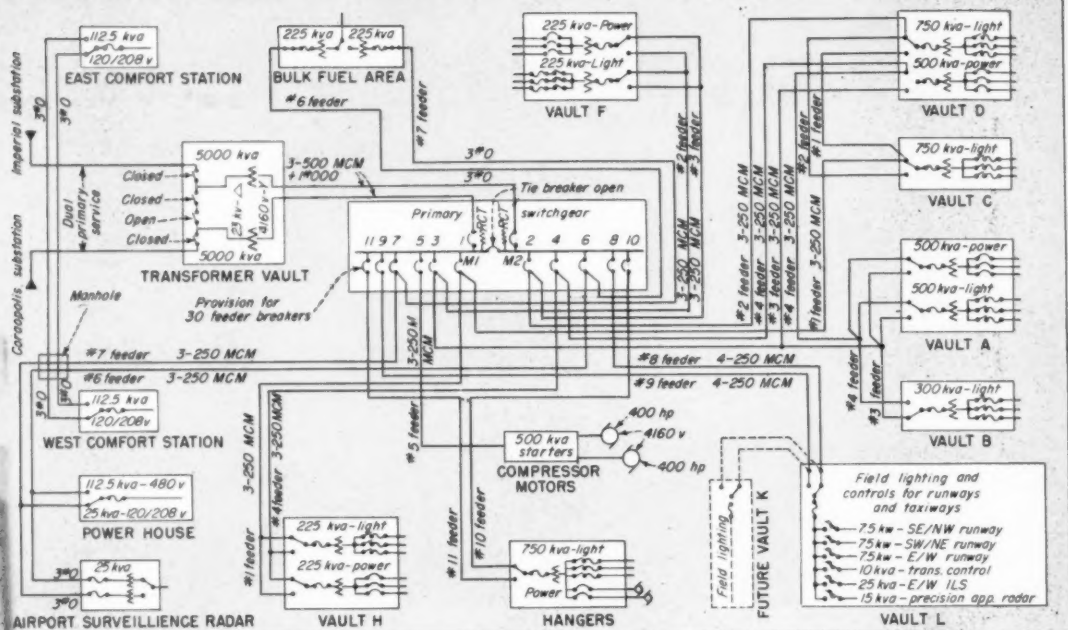
Two service mains, each consisting of 6 No. 500 MCM and 2 No. 3/0

cables, supply power to the primary switchgear. This switchgear consists of two main air circuit breakers, a tie breaker (normally open), and ten feeder breakers. Provisions have been made for adding up to 20 additional feeder breakers, ten on each end of the present switchgear.

Energy from the primary switch-



WEST PARKING LOT is mercury-vapor lighted. It parks 1290 cars. East lot has space for another 1250 cars. Both are easily accessible from the Airport Parkway, which is also mercury-vapor lighted with two-way units.



DUAL PRIMARY insures maximum reliability of electrical service, and power to all electrical equipment at all times.

ESTIMATED MAXIMUM SIMULTANEOUS ELECTRICAL DEMANDS

Load Description and Area	Trans. Capacity kva	Connected Load kva	KILOWATT DEMANDS			
			Present		Ultimate	
			Winter	Summer	Winter	Summer
Lighting						
Vault A—South Dock	500	780	300	250	400	360
Vault B—South Dock	300	543	150	130	200	180
Vault C—Administration	750	1120	400	360	700	600
Vault D—Administration	750	1182	400	360	700	600
Vault F—East Dock	225	20	20	10	100	80
Vault H—West Dock	225	20	20	10	100	80
Power						
Ammonia Compressors	—	800 hp	0	650	0	650
Vault A—South Dock	500	355	100	200	100	200
Vault D—Administration	500	487	150	250	150	250
Vault F—East Dock	225	200	40	40	120	120
Vault H—West Dock	225	100	40	40	120	120
Miscellaneous						
East Comfort Station	112.5	40	30	20	50	30
West Comfort Station	112.5	40	30	20	50	30
Bulk Fuel Area	2-225	330	100	100	150	150
Power House	112.5	100	80	40	80	40
Radar Site	25	25	20	20	25	25
Plaza and Street Lighting	37.5	30	30	10	30	10
ILS System	25	25	20	20	25	25
Plaza Fountain	150	100	100	50	100	50
Approach Lighting	—	—	—	—	300	200
Airlines Hangars			170	120	300	200
Total—County	5000	6297	2200	2700	3800	4000
U. S. Air Force	355	400	250	200	500	350
Pa. National Guard	525	600	150	100	250	150
Total	5880	7297	2600	3000	4550	4500
Estimated Power Factor			95%	90%	95%	90%
Total kva Demand			2750	3300	4800	5000

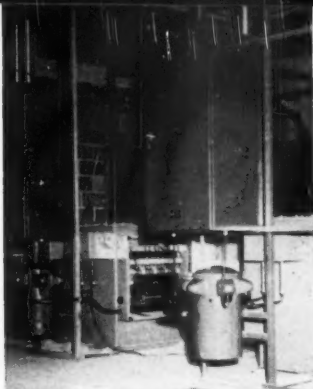
gear is distributed by 4160-volt feeders to six power and eight lighting unit substations, varying in size from 112.5-kva to 750-kva. Each substation is equipped with primary fuses and a primary selector switch, so that it can be fed from either of two sources of power supply over the primary distribution feeders. Two 400 hp compressor motors are fed by a 4160-volt feeder direct from the primary switchgear without an alternate feeder source of power.

Feeder cables vary in size from 3 No. 0 to 3 No. 250MCM between the primary switchgear and unit substation transformers, with most of the feeders using the larger cable. These feeders are run underground in wrought iron conduit, in tunnels in conduit, and racked open in cable vaults. Feeder cables are standard single conductor with 5000-volt ozone resisting type insulation and a neoprene sheath.

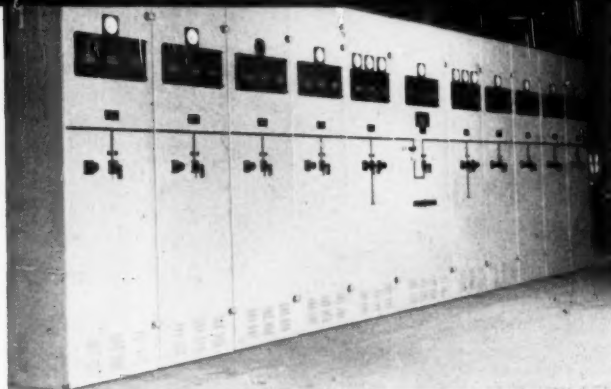
A key interlock safety system is used on all 5-kw breakers in the 4160-volt switchgear as a protection for personnel. This system prevents access to feeder terminals until the feeder breaker is open.

Secondary Distribution

Power is distributed from unit substations at 480-volts, 3-phase, 3-wire—protected by combination thermal and magnetic breakers. No main breakers



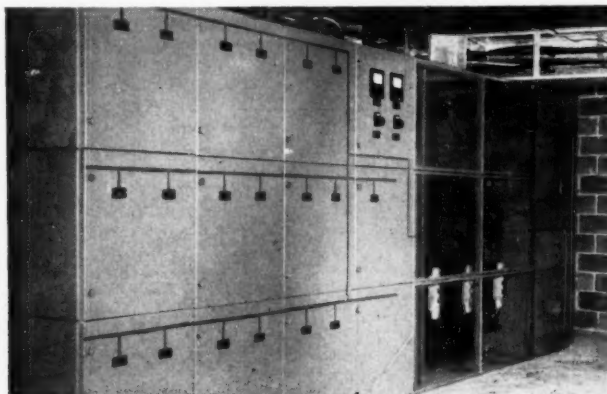
FIELD LIGHTING equipment in vault L with fuse disconnect cabinet, remote control oil switches, and series regulators.



PRIMARY SWITCHGEAR is indoor metal clad 4160 volts, three phase, and consists of two mains, one tie and eight feeder breakers. Two feeder breakers have been added since photo was taken, and space is provided for a total of 30.



PRESSURE CONTROL PANELS (on right) and motor control center for operating gasoline fuel pumps.



LIGHT unit substation in Vault C has 750 kva. transformers rated 4160/120/208-volt connected delta-wye, with primary selector switch on right, meter section in center, and secondary feeder section at left.

are used on the secondary side. The neutral is grounded so that if a fault occurs on the secondary it can be more easily located.

The secondary power distribution system includes feeders, power distribution panels, motor control centers, motor and air cleaner wiring, control and pilot light wiring, and temperature indicator wiring. Subfeeders and motor circuits are protected by smaller combination thermal and magnetic breakers. Feeder cables are type RH-RW 600-volt, color coded cable, run in conduits, in various sizes as required.

Energy for lighting is distributed from unit substations at 120/208-volts, 3-phase, 4-wire—protected by knife switches and amp-traps. No main breakers are used on the secondary side of the transformers.

The secondary light distribution system includes feeders, lighting distribution panels, throw-over switches, branch circuit panels, remote control

switches and the lighting equipment.

Branch circuit wiring is No. 12 or larger type RH-RW, 600-volt color coded, run in $\frac{1}{2}$ -inch or larger conduit. Branch circuit conduit runs are all accessible, being installed between floor slab and suspended ceiling below the slab. None are imbedded in concrete.

Knife switches and dual element fuses are used in lighting distribution panels and toggle switches and dual element plug fuses are used in branch circuit lighting panels.

Grounding System

A grid system is used for grounding. The ends of all wrought iron conduits terminating in an underground unit substation room, motor room or cable vault are all bonded by means of No. 4/0 bare solid copper wire and connected to the grounding grid installed within each room or vault. All pieces of electrical equipment, as well as all metal parts on the plane loading apron are grounded to these grids.

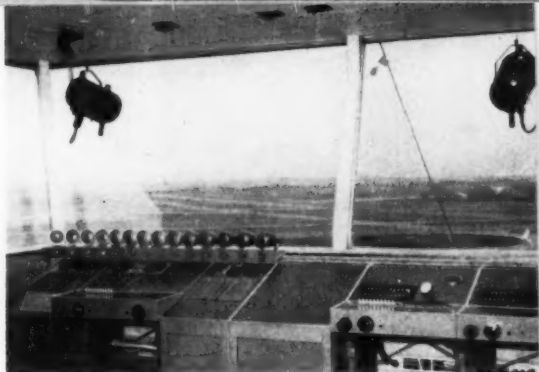
A departure from normal practice was made in the system adopted for servicing planes with fuel. Here fuel storage tanks are installed east of the Terminal Building remote from the building and runways. Provisions are made for three grades of fuel, two grades to be available now and a third grade when aviation progress or air-lines demand it.

Motor-operated fuel pumps supply each grade of fuel from the bulk storage area to the plane loading stations at the Terminal Building. At each plane loading station are two fuel pits, so located that one pit will be under each wing of the airliner to be fueled. Each pit is equipped with a 50-foot motor-reeled hose. Combined with the hose nozzle is a switch control which will automatically turn on the fuel pump motor to provide the necessary pressure for pumping the fuel into the plane's tanks.

This system of fuel handling is an innovation which will obviate the



SOUTH DOCK (right) extends 600 feet from semi-circular Terminal Building. Apron and plane landing areas are lighted by upper row of wall-recessed 750-watt Holophone lens units (inset). Lower row of similar units light sidewalk.



CONTROL TOWER surmounts the 7-story South Dock, affords unobstructed view of entire vicinity. This view is to the South, across all runways, shows some of the control equipment and radio microphones on one side of tower interior.

necessity for any gasoline trucks on the apron, provides maximum safety.

As an added safety feature, in case of fire on the loading apron, an emergency stop button has been installed in a wall-recessed panel opposite each loading station which will stop all fuel pump motors. Also installed in this panel is a telephone, fire alarm, and an emergency stop button for disconnecting all energy in the electrical pits at each loading station.

Lighting

Modern standards and new application techniques feature the new airport lighting. These cover a broad range—first, because of the size and diversity of the project; and second, because of the many types of lighting problems involved. The types of lighting are classified broadly under three headings: 1) outdoor—plaza, roadways and parking lots; 2) Terminal Building—offices, lobbies, public areas, shops, bank, post office, theatre, hotel, dining and banquet rooms, recreational areas, etc.; and 3) field—apron, runways, approach lighting, etc.

Outdoor—The plaza roadway entrances and exits are lighted with mercury vapor lamps in weatherproof housings equipped with prismatic glass refractors to provide asymmetric two-way light distribution. These are installed one to a pole, on pole arms which extend out over the roadway. Units are mounted 26 feet above the roadway, on approximately 100 foot spacings.

Similar units are installed two to a pole in both parking lot areas, with poles spaced 125 feet by 135 feet on centers, 26 feet above the ground. Both the poles and the luminaires are of aluminum. Transformers for the mercury lamps are installed in concrete

ground pits at the base of each pole.

Terminal Building—Before planning the lighting for the Terminal Building, certain criteria and rules were established which would govern design procedure in all cases where possible. It was decided that the lighting equipment should be integrated with the architecture, form a part of it, definitely not be an apparent afterthought. To accomplish this, it was agreed that all lighting equipment should be recessed and carefully shielded or louvered, so that it would provide the desired intensity without glare or being conspicuous. The lighting layouts should be planned specifically for each area, so that light patterns would conform to architectural and decorative treatments, and so that the lighting would be functional.

A design intensity of 50 footcandles maintained was established for all office and store areas, and locations where critical seeing problems of this nature would exist. Lower intensities were permitted for corridors, lounges and public areas. The building in general, however, was provided with wiring feeders throughout to permit lighting intensities of 50 footcandles for any area in case of possible future arrangements.

In corridors, lounges, and public areas generally, recessed louvered panels of various sizes to conform to architectural space details are used to provide the desired amount of light. Shallow coves are used in some of these public areas to supplement the recessed panels, and to light the ceilings softly and add a decorative touch. Stores and display areas are lighted by large recessed louver panels, supplemented by recessed R-lamp units, louvered. Miscellaneous offices, banquet rooms, etc., are lighted by large recessed louver panels, recessed

louvered troffers, and in some cases where structural details would not permit recessing, by louvered surface mounted units.

At the building entrance to the field level vehicular driveways, high intensity illumination is provided to permit an eye-adaptation period for drivers entering the building from daylight. Continuous rows of recessed prismatic glass lens troffers are alternated with continuous rows of surface mounted diffusing units for this entrance.

Field—A new lighting technique employing a new prismatic glass lens luminaire lights the plane loading stations and field apron adjoining the Terminal Building. These units use a 750-watt incandescent lamp, are recessed in the exterior building wall at the second floor level 28 feet above the apron. These units have a 30-degree spread horizontally, project the light out and down, with the maximum candle power punch 16 degrees below the horizontal. Similar units employing 300 watt lamps are also wall-recessed 17 feet above the sidewalk to provide light for passengers using the plane loading gates.

Wiring provisions have been made for approach lighting, runway lights and other landing aids by installing conduits under all runways and taxiways. No decision has been reached by the Air Force, CAA, and airport officials as to types which will be adopted.

Other Electrical Services

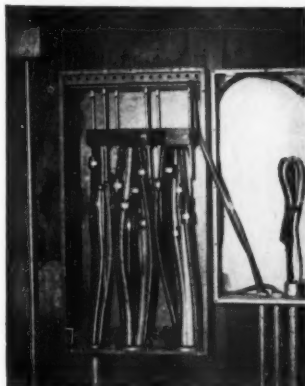
An electrical pit and an air conditioning pit has been installed in the apron at each plane loading station for servicing airliners while in port. Provisions for both ac and dc power have been made in the electrical pits, at various voltage and current ratings for each.



RECESSED and cove lighting feature all public areas of the Terminal building. Recessed units use hexagon-cell large louver panels, in continuous rows and as individual units. Vista from Rotunda through South Dock corridor to theatre.



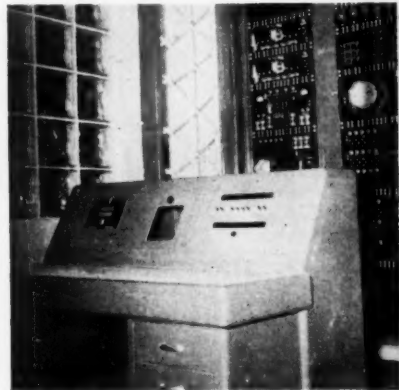
DRIVEWAY ENTRANCE on field level is brightly lit with recessed lens troffers and surface mounted cylindrical continuous row fluorescent units, to provide light-adaptation area for drivers' eyes coming into building from daylight.



VERTICAL CABLE runs are supported in conduit by O-Z fittings which clamp cables and attach securely to top of panel box as shown in panel at left.



SAFETY PANEL on exterior wall is convenient to plane loading station, contains emergency stop buttons to disconnect all electrical energy to field apron.



CONTROL DESK and terminal cabinet for protection signal system is in Fire Chief's office. Center is for tape records of fire alarm and watchmen reports.

A protection signalling system embraces the fire alarm and watchman systems. This elaborate system centers in the fire chief's office. It provides for tape recording of all fire alarm and watchman reports; also for tuning in radio conversations between plane pilots and tower operators, and for monitoring communications and directions to the field.

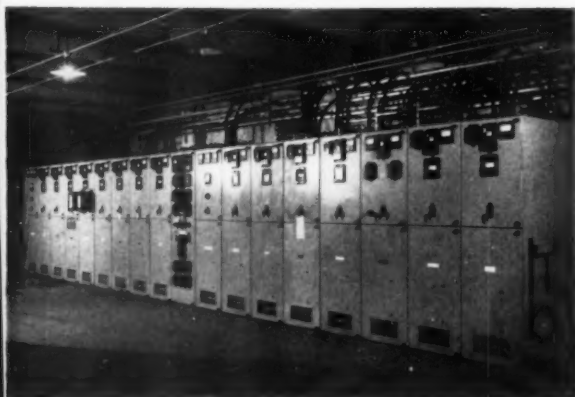
Two paging systems are provided—a voice paging system to announce the arrival and departure of planes, and an executive (visual and audible) system for paging key personnel. The voice system is operated from microphone stations in the office of each airline and from a station in the airport manager's office who has precedence over all other users and can make an emergency announcement at any time. The system is arranged to provide transcribed music when not in use for paging.

Conduits and cabinets are installed for a number of specialized services, such as Bell telephone system, clock system, radio and television receivers including antennas, and for CAA and the Weather Bureau Provisions have also been made for the live broadcast of television programs initiated at the airport.

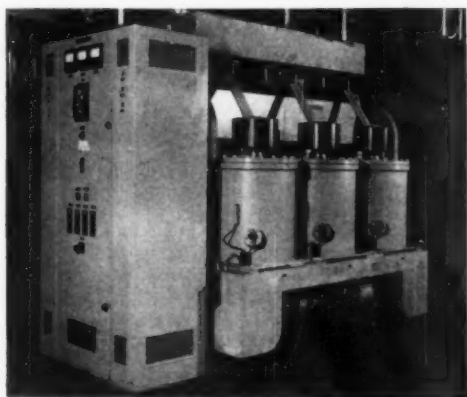
The Terminal Building, when ultimately completed with the addition of the East and West Docks, will resemble a huge airplane spreading on the side of the airfield. The illuminated fountain in the plaza will represent the nose of the plane, while the East and West Docks will represent wings, and the South Dock will represent the fuselage. Within, it will provide every comfort and convenience for its patrons. It will operate 24 hours a day, require an operating personnel of 2500 employees. With a bank, post office, indoor garage, dining,

shopping and recreational facilities, hotel accommodations, theatres, etc., it will literally be a community or small city within itself.

Design of the Terminal Building was by Theodore Eichholz, supervising architect (deceased), under the guidance of Allegheny County Department of Aviation with the capable supervision of Director John B. Sweeny and Chief Engineer Edward G. Messner and with the assistance of Consulting Architect Joseph Hoover. James Paul Warner, consulting electrical engineer, is responsible for the airport's entire electrical system. The five electrical contractors, all of Pittsburgh, who installed the electrical facilities for this project were: Daniels Electric Equipment Co.; Devlin Electric Construction Co.; The Howard P. Foley Co.; Morganstern Electric Co.; and Rodden Electrical Construction Co.



SWITCHGEAR for 250-volt dc control is mounted in dead-front cubicles equipped with draw-out breakers. Cables are racked above switchgear on framing channels (Unistrut).



IGNITRON RECTIFIERS for 250-volt dc conversion have 1500-kw ratings; are supported by shock-dampening mounts; provide non-synchronous tie between ac and dc systems.

Power for a Steelmaker

\$100-million expansion program of J&L's Pittsburgh steel mill raises total motor load to 275,000 hp and annual power consumption to 500-million kwh. Electrical features include hollow square power bus, wide use of variable-speed drives, flexible wiring methods, ignitron rectification, mercury-vapor lighting and modern control.

By Richard W. Barnitz, Plant Electrical Engineer, Jones and Laughlin Steel Corp., Pittsburgh, Penna.

JONES and Laughlin—America's oldest and largest independent steelmaker—is completing an epic 6-year \$420-million expansion program. The expansion increases their open hearth and bessenner capacity by 32% and boosts their annual output above the 6.4-million-net-ton mark. The investment raises the productivity of their three steel works; expands the facilities of their shipping fleets and switching railroads; improves the efficiency of their mining and quarrying operations. It is a corporation-wide production-promoting effort in the interest of national defense and industrial demands for more steel.

Largest segment of this progressive project is a \$100-million program for expanding and modernizing the 276-acre Pittsburgh works, where ingot output is being more than doubled by the addition of 11 stationary basic

open hearth furnaces designed to refine 250 net tons of steel each heat. Also included in the Pittsburgh picture are 12 new soaking pits, a new blooming mill where ingots are rolled into shape, a 16-stand bar mill, new centralized scarfing-yard facilities for handling semi-finished slabs and billets, and 79 new coke ovens. To keep pace with this stepped-up production schedule, many related operations were speeded through the installation of new motors, controls or operation methods.

Electrically, the program necessitated new substations, a revamped distribution system, new control centers, the installation of high-intensity mercury lighting and an expanded maintenance organization.

Motor Load Increased By 35,000 HP

Motorization is extensive; reflected impressively by an installed 20,000

horsepower load in the new 222-by-1430-foot open hearth building (6,530 ac; 13,569 dc) and the connected 14,830 hp installation in the new blooming mill (9,050 ac; 5,780 dc). These additions raise the total number of motors in the plant to approximately 7200. They boost the total connected motor-horsepower load to 275,000 and, together with new lighting and other load building additions, jump the consumption of purchased current from one- to 15-million kwh a month. This indicates extensive electrification, but it should be noted that this purchased current is in addition to a plant-generated 25-cycle annual consumption exceeding 330-million kwh.

To handle the increased utility service, a new 66/13.8-kv substation was installed, with transformers rated for 40,000-kva. High voltage switchgear is of the metal enclosed, drawout



350-TON POURING LADLE, electrically operated and controlled, teems ingots in J & L open hearth shop at rate of $6\frac{1}{2}$ -million tons of steel per year. Electric locomotives and charging machines are other heavy current consumers in this new 7-acre building.

breaker type installed indoors to facilitate maintenance and reduce deterioration.

Since the nature of steel-making calls for many variable speed applications that are accomplished more effectively by dc equipment, direct current is distributed generally rather than locally through the plant, and high voltage utility ac service is converted by four 1500-kw 250-volt ignitron mercury arc rectifiers connected to transformers served directly by primary feeders. These rectifiers provide the necessary amount of dc power, independent of variations in frequency in the supply system and maintaining voltage in the utilization systems.

Square Busses Minimize Reactance Losses

Rectifiers and rectifier transformers (four 1780-kv units) are connected by

500 feet of 7-inch and $2\frac{1}{2}$ -inch square ventilated copper busses. Bus sections (designed for 600-volt service) have current-carrying capacities of 7500- and 2160-amperes (for the 7- and $2\frac{1}{2}$ -inch busses respectively). They are enclosed in louvered non-magnetic housings, separated from each other and from sides and bottom of the enclosure by porcelain insulators that support the various bus-holding U-clamps. In a typical assembly (see sketch) one 7-inch neutral and six $2\frac{1}{2}$ -inch square phase busses are installed on the same horizontal axis in common enclosure. Advantages of the installation are unusually low reactance and voltage drop values.

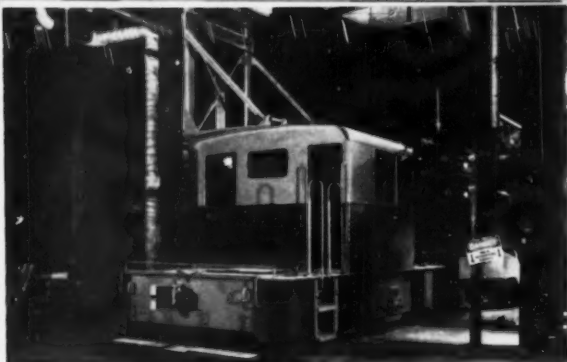
Distribution between all utility transformation stations (of which there are 8 major; 12 minor ones) and local switching centers is at high voltage (13,800 or 4160), carried either under-



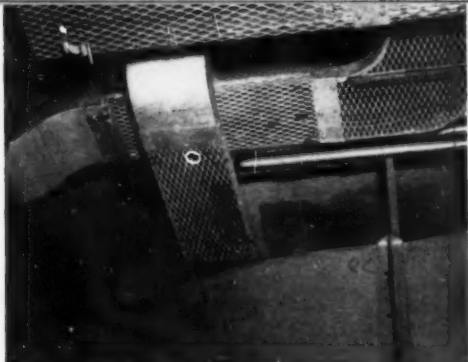
VARIABLE VOLTAGE PANELS required intricate wiring during installation. Nearly stepless selection of motor speeds are provided within set limits.



BUS INSTALLATION, connecting blooming mill's 10,000-hp twin drive with main m-g set, is carried close to ceiling supported by insulated brackets.



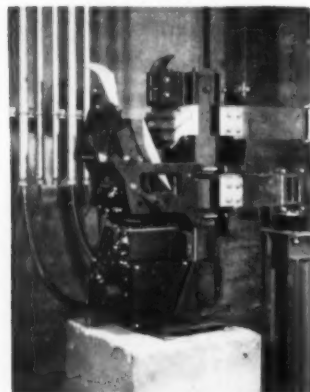
POWER FEEDRAILS (arrows) at different elevations and on different sides of electric locomotive tracks provide continuity of power between hi-bay open hearth shop and lo-bay mixer building. Other feedrails provide power for cranes.



OPEN MESH TROUGHS (by Cope), used extensively for support of secondary branch wiring, are easily installed with minimum of tools or special training. Construction gives good ventilation, flexibility, accessibility and safety.



HOLLOW SQUARE BUS is used in this substation installation to connect transformer on floor below with air breaker on floor above.



5000-AMP CIRCUIT BREAKER, serving one of four generators incorporated in the new blooming mill's main m-g set, is pedestal mounted; solenoid closed.

ground in Transite conduit or as open overhead wiring. Since this open wiring is pole- or tower-mounted high above yard areas, or above lower chords of roof trusses in the various mill buildings, it is protected against mechanical injury, it does not endanger maintenance or operational personnel, yet it is readily accessible for inspection, is quickly tapped for alterations or extension, is easily installed and is economically advantageous due to ready dissipation of heat and the resultant high current-carrying capacities.

Flexible Wiring Methods

From local switching centers to utilization points, distribution is largely by metal framing units (Unistrut), open mesh troughs (Cope) and conduit.

Since metal framing members can be installed without welding or drilling and are also easily adjustable and totally reusable, they can be quickly installed, shifted or salvaged. And, by using maple cable saddles and clamps, wiring can be temporarily or permanently installed to permit complete flexibility.

The expanded-metal open mesh troughs also permit extreme flexibility for making connections, alterations or extensions to circuits. With curved elbows, cables can be pulled around angles without danger or injury, and mesh sections can be cut and installed by using only hacksaws, wrenches and screwdrivers.

Miles, rather than feet, is the denominator in the wiring program. For example; the new open hearth and blooming mill projects utilize 47 miles of low-voltage feeder cable, 65 miles of motor feeders, 83 miles of miscellaneous wire for lighting and communication circuits, 16 miles of multi-colored control cable, nearly 9 miles of

15-kv cable, a mile of 5-kv cable and 3 miles of grounding wire. While some of the wiring is via underground ducts, open metal troughs, or overhead cleats and brackets, the bill of electrical material also includes 63 miles of rigid metal conduit.

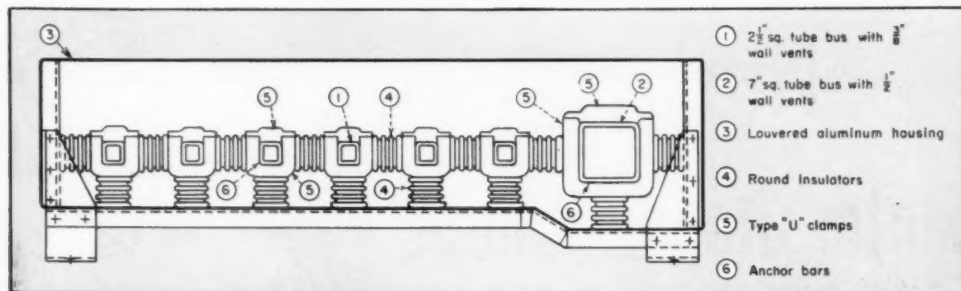
During the construction period, temporary power for contractors was supplied by two pole-mounted utility services; one being 3-phase 440-volts, the other three-phase 220-volts. Two additional pole-mounted lines supplied 250-volt dc power for temporary mill service, consisting of four 1-million-CM cables per leg.

Motor utilization voltage levels include 13.8-kv 3-phase 60-cycle ac (for such items as an 8,000-hp induction drive on the main m-g set), 4160-volts (for such units as the 1250 hp pump drives), and 440-volts (for the smaller motors, below 350 hp). Single-phase fractionals are run either at 220- or 110-volts. There also is available 250-volt dc, 440-volt 25-cycle and 6900-volt 25-cycle power.

Critical Motor Control

Since critical control of motor speeds is practically synonymous with the quality of basic steel, a large proportion of J & L's new motors are adjustable-voltage variable-speed units. For example; in the new blooming mill, over 70% of all dc motors are variable voltage. These motors provide nearly stepless selection of speeds within given limits, enabling machines to do their designed jobs at speeds best suited for each step, as well as for the skill of the operator. This promotes quality of product, reduces waste, simplifies and coordinates successive operations within the mill.

While the majority of steelmaking operations are closely supervised, many motors operate semi-automatically



CROSS SECTION through typical square-bus support assembly indicates relative positions of 2½- and 7-inch ventilated current-carrying tubes supported by insulators and clamps within louvered aluminum housing.

through rotating-type controls that provide fast, accurate operation of the heavy equipment. By regulating voltage and current, these controls limit loads, maintain constant torque, regulate power factor and reduce electrical and mechanical shocks during production cycles. High-inertia loads are accelerated and decelerated in minimum time.

Due to their delicate construction, photocell and electronic control units are not generally applicable for steel-mill utilization and, for this reason, they are used only in cases where no other equipment will do the job as well, as quickly or as economically.

Modern Operators' Pulpit

Most modern control center in the plant is a streamlined totally-enclosed operators' pulpit mounted over the tables on the new blooming mill. Large multiplate full-vision windows, tilted outwards and tinted to minimize reflection and glare, permit the three operators in the pulpit to observe all operations on the huge rolling tables beneath them. Observation of indicators and recording devices within the enclosure is facilitated by the use of narrow-rim dials and meters, and by the installation of continuous indirect fluorescent cove lighting which provides even, diffuse, glareless illumination for seeing. An insulating shield beneath the pulpit blocks heat rising from the white-hot slabs passing beneath this elevated observation and control point, and atmospheric comfort is maintained by a self-contained air-conditioning system. For communication purposes with persons outside of and distantly removed from the pulpit, there are telautographs, loud speakers and dial telephones.

Nowhere around the mill is the story of steelmaking progress preached

more fervently than from this pulpit, for whereas steelmaking formerly was a backbreaking manual profession, it now becomes an industry controlled by skilled artisans who control and direct the operation of powerful machines by pushbuttons, levers and remote controls. And whereas early steelmaking had a definite element of hazard, modern practices have made personal safety a mill byword. Constantly, this giant industry is replacing manpower with horsepower and substituting supervision for direct effort. This is clearly indicated in the Pittsburgh mill where, of the 12,000 employees, over 700 of them already are employed in supervisory capacities, and the number is constantly growing.

High-Intensity Mercury-Vapor Lighting

Those familiar with earlier steel mills are impressed with the high illumination levels maintained in the new buildings, for hi-bay lighting includes 400-, 1000- and 3000-watt mercury-vapor units as well as 1000- and 1500-watt incandescent lamps. Light loads in the open hearth, blooming mill and new motor room average higher than 2 watts/sq. ft. and intensities vary between 20- and 35-foot-candles, depending on mounting height, spacing of units, lamp size and maintenance schedules.

Maintenance of fixtures is facilitated by the installation of individual switches and disconnecting devices at each 3000-watt mercury hi-bay unit, so it is possible to quickly and safely disconnect and replace fixtures requiring relamping or other maintenance. The necessary maintenance work can therefore be accomplished in a central location at floor level, after which the reconditioned unit is replaced in stock for subsequent rotation when required in another location.

Incandescent stem-mounted fixtures, secured to the underside of overhead traveling cranes, are protected against breakage by shock absorbing mountings, and prevented from dropping by safety latches.

Rail yards, storage areas, exteriors of buildings and fence lines are illuminated by conventional floodlighting units.

Work Completed in Two Years

Since May, 1950, when ground was broken on the site of the new open hearth building, 19 major contracting firms have pushed this gigantic expansion program to completion by working 'round-the-clock 7 days a week with 1500 to 2000 men on the job at all times. The general electrical installation in the open hearth and blooming mill was by the Howard P. Foley Company. Sargent Electric Co. wired the open hearth furnaces, and Patterson-Emerson-Comstock Inc. was in charge of electrical work associated with the bar mill installation. Supervising the installation for Jones & Laughlin were Julius E. Graf, chief engineer; George A. Kaufman, chief electrical engineer; W. H. Wachter, assistant chief engineer, and Richard W. Barnitz, plant electrical engineer.

With its annual power consumption of 500-million-kwh and its total connected motor load of 275,000-hp, this expanded and modernized J & L plant gives authority to the declaration that "when steel booms, Pittsburgh prospers." And, with the new work including 225 miles of wiring, the pioneering use of square power bus, the wide use of variable speed motors, a modern operators' pulpit, flexible wiring methods and the primary application of ignitron rectification, this project adds an impressive chapter to the story of Pittsburgh's Renaissance.

Pittsburgh Motor Repair Shops

- ... serve nearly 2000 highly-motorized industrial plants
- ... do a combined gross annual business of \$4-million
- ... conserve materials and manhours by adopting numerous practical techniques and ingenious methods.

By Hugh P. Scott



LARGE HYDRAULIC PRESS with lever-action plunger exerts 100-ton force on armature shafts. Frame and arbors can be adjusted within wide limits. Fig. 1.

MOTOR repairing is *big business*, representing a national annual investment exceeding \$100-million. This figure does not consider the sale and installation of new units. It omits, as well, the cost of in-plant routine motor maintenance. It covers only a single item: Motor shop repairs.

In the Pittsburgh area alone nearly \$4-million is spent annually by some 2,000 manufacturing and industrial plants to keep their motorized equipment in peak condition. And, considering that Pittsburgh ranks third in the nation as an industrial center (surpassed only by Chicago and Detroit) this impressive dollar volume is not surprising.

For example: several of the larger steel mills in the area have over 7,000 motors in operation, while many industrials depending on mass production methods and powered conveyance of materials have motor totals running well into the thousands. The widespread adoption of diesel equipment by eleven railroads serving Allegheny County is also boosting the demands for motor repairs, while mining remains as another heavyweight in the field of motorized equipment.

Three classifications of shops cater to these demands in the Pittsburgh region. First are those shops set up within some of the larger plants, established to keep units within these plants operating. This type of shop was fairly common during the last war, and this set-up could be found in most of the steel mills. Only a few of these shops, however, do *all* of their motor repairing. The others take care of bearings, shafts, commutators, brushes and the like, but have their rewinding done by outside companies. At present, the number of in-plant shops is decreasing, for the problems of extra personnel, space, material deliveries and paper work are constantly lessening the benefits to be achieved. One of these benefits, that of abbreviated down-time, is being retained through the mediums of spare stock motors and preventive-maintenance inspections, tests, lubrication, overload relays and routine renewal of worn parts.

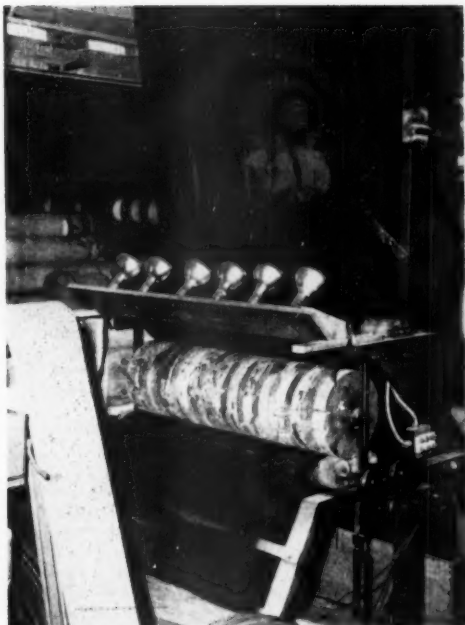
The second classification includes those repair shops established by some of the country's motor manufacturers, such as General Electric, Westinghouse, Wagner, Century and Delco.

These shops, backed by manufacturing facilities, offer the advantages of new parts, factory methods and standard reconstruction. They conform with time-tested procedures, giving their customers motors "as good as new."

Independent Shops Stress Ingenuity

The third and largest classification, however, includes some 30 independently owned and operated companies with rosters ranging from a few men to over 150 employees. This group can be subdivided into NISA shops and those having no affiliations with national organizations. Several shops in this latter group are unsurpassed in either ingenuity or efficiency. This may be due in large measure to the fact that owner-operators, with their very personal financial interests in their business ventures, are constantly looking for new methods, machines and materials to accomplish tasks with smaller expenditures of time, effort or money. Competition being what it is, these savings are gladly shared with customers in the interest of plus business.

A quick swing around the shops in this area offers a liberal education in



BANK OF INFRARED LAMPS speed the drying of varnished cambric as it slowly passes between guide rollers. Speed of travel can be regulated to obtain desired drying period. Cambric can be rolled for storage or used immediately. Fig. 2.



MOBILE DYNAMOMETER can be rolled to any work bench to provide temporary facilities for testing small motors, then rolled away when not in use to leave working area unobstructed by idle equipment. Fig. 3.

motor shop practices and techniques. Practical ideas by the dozen can be observed; ideas covering not only the mechanics of stripping and winding, dipping and baking, building up worn shafts and balancing rotating elements, but covering as well the associated factors of records and inventories, shipping and material handling, advertising and industrial safety.

For example; in the NISA shop of Braunlich-Roessle, considerable emphasis has been placed upon mobile equipment such as rolling dynamometers for testing small motors (Fig. 3), mobile soldering stoves and metal spraying equipment, and castor-mounted growlers, band and jig-saws. These pieces of equipment can be rolled quickly to any bench to perform a required service, then rolled away to leave the working area uncluttered for other purposes. In addition, one machine can be used by several mechanics and, as is the case with the stoves and saws, the elements of heat or hazard are removed from a working area when their use is no longer required.

To provide compressed air, gas, hydrogen and live steam to all benches

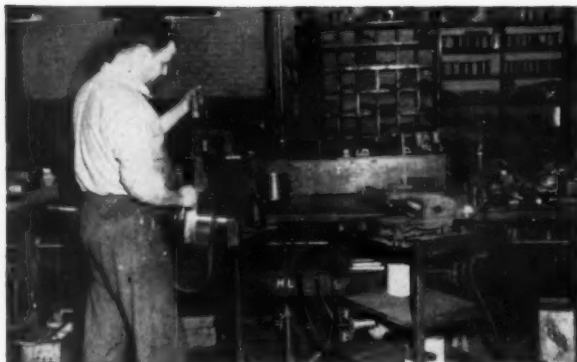
in this same shop, series of pipes are run beneath the work benches, equipped at each working location with a group of pressure-valve outlets (Fig. 4). When any of these piped services are required, the employee merely plugs in the flexible hose connected to the equipment he wishes to use and thus establishes his utility contact. Since the connections are push-pull pressure valves, there are no handles to turn, no threads to engage and no parts to wear out. Also, the pipes are out of sight and out of the way, floors and ceilings are left unobstructed, protection is obtained for workers and pipes alike and it is unnecessary to keep an array of steel tanks at various points around the shop. Valves are plainly lettered to prevent the tapping of a wrong utility.

100-Ton Press Has Wide Limits

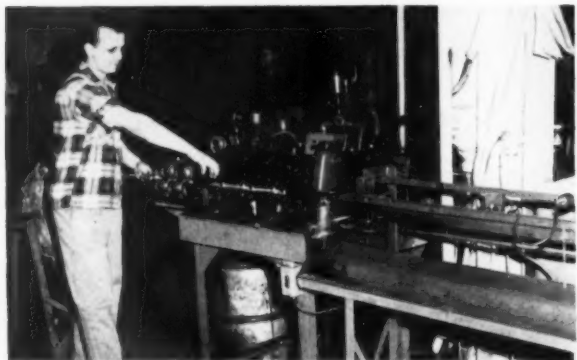
For pressing shafts from or into large armatures, Braunlich-Roessle uses a 100-ton lever-activated hydraulic plunger, incorporated into the yoke of an adjustable frame capable of being set for any combinations of spans up to 5 feet in width and 15 feet in length (Fig. 1). The rear arbor

is set on rollers for easier adjustment and the various terminal limits are established by inserting 1½-inch steel pins into the side braces at desired positions to back up the adjustable arbor collar. Channels are hefty 2-by-4-inch bar stock. As an aid in positioning armatures in this horizontal press, an overhead traveling crane and remote-controlled 1-ton hoist are available.

In the shop of the Pennsylvania Electric Coil Corporation—one of the finest independent shops in the country, incidentally—coils are vacuum impregnated in a floor-recessed tank designed to sustain 28½ pounds of vacuum and pressures of 75 psi. (Fig. 5) The tank measures 4 feet across and 6 feet deep; the heavy hinged cover is dogged tight by a dozen 1½-inch toggle bolts; the cover and coil basket are raised and lowered by means of a traveling electric hoist, and the level of the varnish in the tank can be observed through a thick glass viewing port in the cover. To provide light within the tank for observation purposes, an explosion-proof lighting unit is also mounted in the cover, current being supplied through a flexible cable. Im-



PIPELINES BENEATH BENCHES provide gas, hydrogen, live steam and compressed air for many shop operations. Flexible hose connections, such as that on this portable soldering stove, are plugged into lines by means of push-pull pressure valves. Fig. 4.



STRAP WIRE FOR COILS is automatically measured, cut, counted and stacked by device combining traction wheels, hydraulic shear and terminal-limit trigger. Connection plug for limit trigger (arrow) can be inserted into nearest outlet of plug-in strip. Fig. 6.

pregnation is positive, for coils are pre-baked, lowered into the tank by the basket, subjected to vacuum to remove all residual moisture and trapped air, then submerged by varnish which is admitted through a bottom-connected supply line, and finally placed under positive pressure to force the varnish into all interstices. When the impregnation cycle is completed, the bottom valve is re-opened to permit the varnish to be forced back into its reservoir, pressure is returned to atmospheric, the cover is undogged and raised, and coils are transferred to oven racks for rebaking.

As a preliminary to making strap-wire coils, Penn Coil cuts flat wire stock to desired lengths by means of an ingenious machine combining traction rollers, terminal limit and trigger switch, an electrically-tripped shear and an automatic counter (Fig. 6). In

operation, the limit switch is set at the desired distance from the cutter, and the wire is rapidly fed through the traction rollers and along a supporting gutter until it comes in contact with the trigger of the length-limiting stop. On striking this switch, the remotely-controlled shear is activated, the counter records the cut, the supporting gutter flops down and back again to drop the cut length of wire on an assembly cable, and the cycle is repeated without interruption. Traction rollers are motivated by a gear-motor drive, and the electrically-tripped cutter snaps down under hydraulic pressure. To provide a wide range for setting the terminal trigger stop, a section of plug-in strip parallels the supporting gutter and the trigger connection can be plugged into the outlet closest to the desired stopping position.

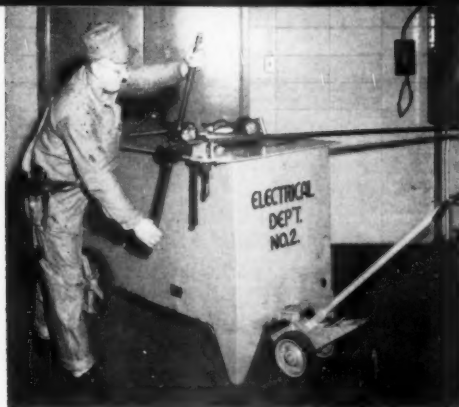


VACUUM AND PRESSURE TANK is floor-recessed for ready accessibility; is equipped with explosion-proof light and observation port in the cover. Fig. 5.

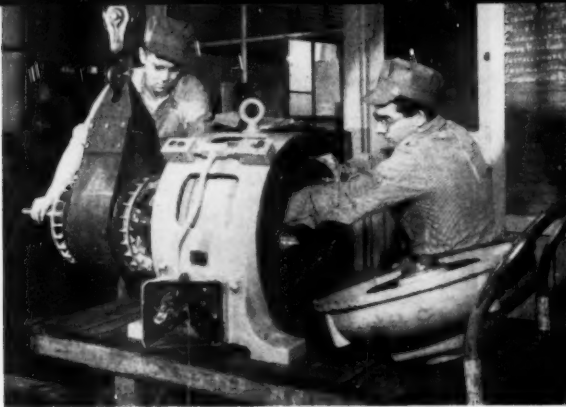
Still another useful idea gleaned from Penn Coil is the use of infrared lamps for speeding the drying of varnished cambric which is impregnated in the shop (Fig. 2). Banks of closely-spaced lamps are mounted in horizontal series a few inches distant from the surface of the slowly-traveling cloth. Speed of travel can be regulated to insure thorough drying.

Many of the shops in the Pittsburgh area have improved the efficiency of their organization by straight-line positioning of related working areas. As a result, motors are received and logged in, tested, stripped and cleaned, rewound, baked, painted and shipped out with a minimum of crossing production lines and a minimum of traveling between operations. Different methods for performing specific operations are also concentrated in one area for maximum efficiency. For example; Westinghouse's Manufacturing and Repair Department has an initial stripping and cleaning area combining a caustic tank for softening insulation from coils, a burning chamber, coil pulling tongs, live steam spray booth and sand-blast booth. All are served by overhead cranes and motorized industrial pallet trucks. Lighting is installed to give adequate general illumination (with combinations of incandescent, mercury vapor and fluorescent lamps being used), while localized lighting over equipment requiring greater see-ability consists of angle-suspended fluorescents.

All of these notations tell the same story: that Pittsburgh is a highly-motorized industrial center; that it is served by many fine repair shops, and that these shops collectively represent a practical assortment of useful, tested and proved techniques.



MAINTENANCE TRUCK, one of four used by maintenance personnel, is rubber tired, equipped with machinist's and pipe vise, contains bins and lockers for parts, materials, tools.



RECONDITIONED 75 HP MOTOR, with bearings checked, windings cleaned and frame painted, is reassembled preparatory to final insulation and operating tests.

At the H. J. Heinz food-processing plant in Pittsburgh, their famous . . .

'57 VARIETIES' DEPEND ON MAINTENANCE

. . . of electric motors, controls, elevators, generating equipment, distribution systems, lighting and modern production machines.



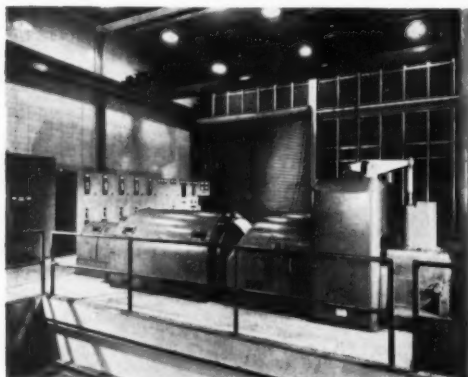
AIR VIEW of Heinz' Pittsburgh plant shows most recent additions to this food-producing center. Approximately 3500 motor-operated machines are installed, representing a major responsibility of the maintenance department.

FOOD processing today is a motor-operated industry; each process depending upon the uninterrupted functioning of electrical equipment. Therefore effective electrical maintenance is a *must*, for if spoilage of food is to be avoided and product purity insured, refrigeration *must* be reliable, material handling and conveyance *must* be continuous, processing and canning operations *must* be dependable. Since spoiled food cannot be salvaged, a power failure or machine shutdown can result not only in lost manhours but in lost produce as well. Should power fail, many processing cycles would have to be entirely repeated rather than merely continued. All these truths have prompted the H. J. Heinz Company to subscribe unreservedly to a program of *preventive* electrical maintenance.

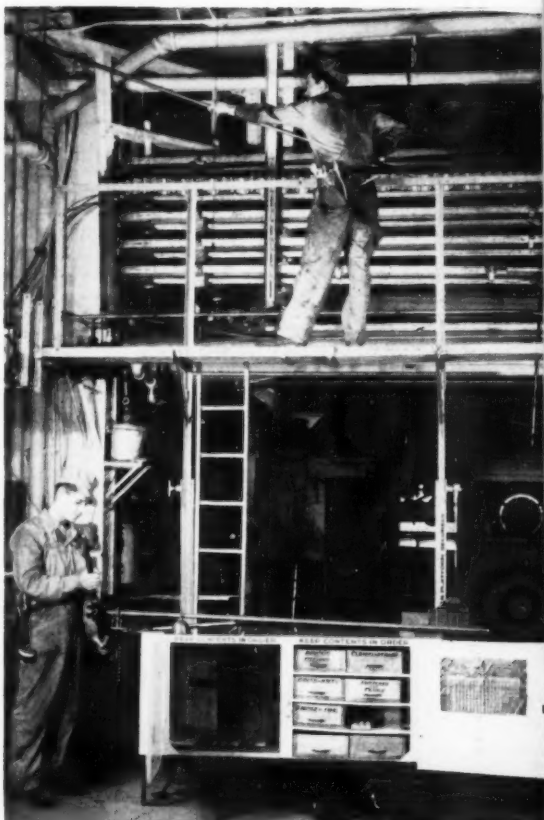
The importance of motorized food-processing is indicated by reference to the Pittsburgh plant where approximately 3500 motor-operated machines are installed. This extensive motorization, besides promoting highspeed operation, has necessitated the installation of an extensive distribution sys-



ASSORTMENT OF INSTRUMENTS used for maintenance work includes volt- and ammeters, Meggers and ohmmeters, tachometers, locators and lightmeters. Instruments cover dc and ac applications; indicating and recording devices.



PLANT GENERATING TURBINE, rated at 3000-kw 3750-kva 2300 volts, is connected in parallel with primary feeders from utility network. Switchgear includes tie and feeder breakers.



ADJUSTABLE SCAFFOLD is useful maintenance aid for working in high bay areas, establishing new circuit arrangements, cleaning and relamping lighting units.

tem, exacting controls and numerous safety provisions. Also, since higher operational speeds recommend higher levels of illumination for purposes of personal safety and accurate perception, the trend has been towards planned fluorescent lighting.

Maintenance of the motors, elevators, generating equipment, distribution system, controls, production machines and lighting requires a plant electrical department having a roster of 32 electricians, 2 lead men and a department head.

In general, maintenance personnel are assigned to buildings or areas rather than to types of equipment, and these men remained continuously near the equipment for which they are responsible. In cases where emergency work exceeds normal routine, adjustments of assignments temporarily shift electricians as required.

Certain pieces of equipment, (elevators, main generators, water pumps) because of their nature or importance, require constant supervision, and men are assigned specifically to these machines. In other instances, certain areas or machines require such a limited amount of maintenance that they are serviced, when required, by a man dispatched from the central maintenance office.

In several respects the maintenance problems are unique, for there is encountered considerable oil and grease—byproducts of food processing—plus high temperatures, steam and water.

New men are trained for maintenance work in several ways, including (1) field instruction under the guidance of experienced electricians, (2) weekly meetings at which actual problems encountered around the plant are discussed and solved, (3) visual aids

and (4) a library containing a comprehensive collection of technical books, manufacturers' literature and major electrical trade magazines.

Inventories

Inventory of maintenance supplies and replacement parts is necessarily large, for it must satisfy not only the demands of normal operation but the possibilities of re-arrangement of equipment, extension of circuits and variation of control brought about by changes in process schedules. Depending upon the frequency of use and the importance of various machines, supplies and parts are stored either centrally, adjacent to the electrical shop, or near the center of local operation. Most motors, for example, are stored in a separate building where space is not at a premium, although certain key motors are stored close to the loca-

tions where they would be needed promptly. This combination storage plan provides for maximum efficiency in the utilization of space, with the provisions for minimum down time of important equipment. In addition to motors, inventory items range from bearings, contacts for magnetic starters, pushbuttons and overload relays to fuses, lamps, receptacle switches and all types of wiring supplies.

Inventories are maintained within predetermined limits through the mechanics of a perpetual Cardex filing system. All withdrawals or additions of stock items are recorded, with running totals constantly giving accurate pictures of each item's availability. To keep records in order, withdrawal forms are filled out for each material request, and forms are issued by the office clerk to only authorized personnel.

Records and Tools

Paper work covers five major categories: electrical plans and system details, motor and machinery records, system surveys and test data, the material inventory records just discussed, and cost records. All are important, for plans eliminate confusion and uncertainty when maintaining or revamping the systems, motor records provide essential finger-tip case histories of equipment, test data provides the basis for intelligent operation, inventories assure minimum yet adequate stocks, and costs prove the wisdom of investing in preventive maintenance.

A typical record is a motor inspection follow-up schedule card (Form M-1320) which includes all pertinent data referring to each installation. On the back of each card is the service record of the motor, indicating all repairs made, their cause and cost. Analysis of these records verifies the selection of a motor's characteristics and, together with periodic load tests, proves the wisdom of the particular horsepower, torque and speed.

In addition to motor reports, all electrical equipment is inspected annually and its condition recorded (Form E-105). These annual inspections include load and insulation tests, inspection of breakers and fuses on all switchboards, and notations of worn or damaged parts requiring repair or replacement. From these inspection reports, a maintenance budget is prepared and presented as the basis for the following year's maintenance appropriation.

Tools constitute a very important part of the maintenance equipment

and, in this category, are listed mechanic's tools (such as screwdrivers, pliers, wrenches, hammers, tape, flashlights and pocket knives), shop tools (such as pipe threading equipment, benders, large wrenches and electric drills for large jobs), special purpose tools (such as sectional aluminum scaffolds) and instruments.

Many of the shop tools are stored in small maintenance trucks, several of which are in continual use. These trucks can be wheeled easily by one man, they are rubber-tired so as not to mar tile or hardwood floors and they are equipped with vices and bins for small parts. These trucks have provided invaluable service in reducing down time.

Instruments

Electrical instruments are essential to check operating conditions and, by diagnosing these conditions and analyzing the data obtained, steps can be taken to prevent system breakdowns, reduce the waste of current and generally increase plant efficiency. The most useful and widely used instruments include tone-type ammeters, ac and dc voltmeters (indicating and recording), wattmeters, tachometers, Meggers, power factor and light meters.

Meter equipment is under the jurisdiction of the stock room attendant and is issued upon the signature of the electrician desiring its use. Meters are kept repaired and calibrated by local testing laboratories.

The electrical department, because of its responsibility for the maintenance and operation of all electrical equipment, is consulted whenever a new machine is contemplated. By analyzing the characteristics of equipment before it is purchased, checking its installation and noting the reactions after operation has commenced, an intelligent maintenance schedule can be set up. This reasoning has influenced the design of the entire distribution system, the selection of all equipment and the planning of all operational details.

Distribution

The Heinz Company is electrically served by a 3000-kva 3-phase 60-cycle 2400-volt generator operating with an 0.8 power factor. It operates in parallel with primary power supplied by the local utility company and is protected by reverse-current relays. By generating steam at 600 psi for the new turbine, and exhausting at 125 psi, it is possible to use the exhaust of the pressure as process steam or make-up,

for process is obtained through a reducing station. By using generator steam as a byproduct, relatively low energy costs are realized.

Primary distribution at 2400 volts is underground, with the main switchboard served from the turbine room by four 500MCM feeders; each feeder handling approximately 1500-kva of substation transformer capacity. The majority of these subs are unit types complete with high-voltage transformers and all necessary switchgear. Each station is also served by an emergency 2300-volt cable, protecting the system against failure of either tie lines or local generating equipment.

Secondary distribution is 440-, 230- and 208/120-volt 3-phase and 230/115-volt single phase. Low voltage service is supplied through locally-installed dry-type transformers.

Lighting

Lighting is obtained from fluorescent, incandescent and/or mercury-vapor fixtures, with general illumination averaging 25 footcandles and local illumination ranging up to 200-fc, depending upon the importance of the food-processing operation being lighted. The boiler and turbine room, with 400-watt mercuries and 750-watt incandescents in combination fixtures, has a maintained intensity of 50-fc.

Fluorescent units are generally hot cathode 2-tube 40-watt closed or open end porcelain enamel reflectors for factory lighting. Office lighting is accomplished by the same basic fixture equipped with louvers, providing 45-degree cutoff angles crosswise and 30-degree cutoff lengthwise. Louvers are lacquered in light grey, resulting in a surface brightness of approximately 120 footlamberts. Office lighting designs vary in intensity from 35- to 45-footcandles, depending upon ceiling patterns.

Maintenance of lighting units includes periodic cleaning of lamps and reflectors, although their records indicate that the regular cleaning of louvers has little effect on the light loss. This finding, while contrary to general maintenance recommendations, is probably due to the normal cleanliness of the air in the Heinz food-processing factories.

In an electrified industry such as this, production and operation are definitely dependent upon planned, preventive maintenance, for equipment is of little value when inoperative or inefficient. Preventive maintenance cannot be overestimated. It is the basis for industrial economy, efficiency, safety and dependability.



UNITS OF A NEW LOW-COST HOUSING development under construction at McKeesport look out over the busy industrial valley a few miles from the Golden Triangle. Electrical distribution pole lines serve an outside fused disconnect at each building. Attic feeder is tapped for sub-feeder to each two-story apartment fuse panel.

RESIDENTIAL WIRING

Hale Electric Company's operations typify Pittsburgh's approach to wiring for housing projects and residential service modernization. Red Seal promotion encourages high adequacy standards.

PITTSBURGH, like other industrial cities, is gradually working its way out of an acute housing shortage. Extensive suburban developments, mass housing projects and new apartment buildings provide a substantial market for electrical contractors in the area. Service modernization to take care of appliance loads in existing homes is a streamlined, skillfully organized project with costs to the customer among the lowest in the country.

An active and aggressive Red Seal certification program, operated by the Electric League of Western Pennsylvania, is a strong influence on residential wiring standards. Approximately 10 percent of the new houses built are certified as meeting the exacting requirements for electrical adequacy. But the influence of the promotional effort is actually much wider than the number of homes certified. Another 40 percent of the homes built, say League executives, are actually wired to standards which vary only in minor details from the certification requirements.

Out of a list of over 200 house-wiring contractors, only a baker's dozen are actively and regularly working with the League on its adequate wiring

program. But these few account for a large percentage of the total house-wiring market in the area.

Certification standards require at least a No. 4 service and a No. 6 range circuit for a small house; No. 2 service in a 7 room or larger house. Two appliance circuits are a minimum. Individual circuits are required for furnace motor, water heater, electric sink, automatic washer, dryer, bath heater and water pump where these appliances are installed. Switching standards require wall switch control of all fixed outlets in living quarters and multiple switch control on stairs and in rooms with more than one principal entrance when more than 15 feet apart.

Most service switches and panels are fusible equipment. In new residential work circuit breakers are relatively rare. Red Seal rules are strictly neutral and either type of overcurrent protection is acceptable providing that the number of circuits and their capacities come up to the standards.

A sample of wiring practice in low cost mass housing is afforded by the McKeesport project now under construction. Twenty-one buildings vary in size from 7 to 10 units each.

Hale Electric has the electric con-

tract which includes a pole line secondary distribution system between the buildings. Service cable terminates at a 60 ampere, 3 wire pull out type weather proof fused cutout on the outside wall of each building. No. 4 conductors in EMT extend the length of the attic space above the apartments. Junction boxes (6 x 6 x 4") break into the feeder run above each unit and a tap of three No. 10 drops to a 4 circuit fused flush panel.

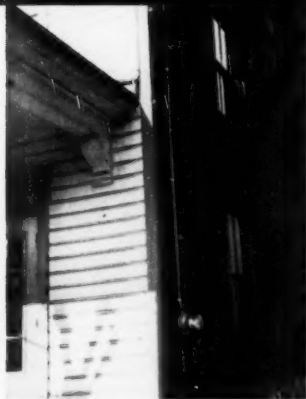
The buildings are served with gas for cooking so no provisions are included in the wiring design for electric ranges. The branch circuiting is conventional, but with better-than-average switching for a low-cost housing project. Each room has a ceiling fixture on a wall switch and stairs are provided with a pair of 3-ways.

A major headache for wiring promotion is a strongly entrenched gas utility and a stubborn tradition of gas cooking in the area. To offset the disadvantage of the high cost of service modernization to take modern electric appliances, the electric utility bears about half the cost. By standardization, mass production methods, modern equipment and careful scheduling, the Hale Electric Co., operating under a contract with

Service modernization work in the Pittsburgh area is carefully scheduled and installed by trained crews. The photos (right) were taken two hours apart on a job selected at random from the day's routine of Hale Electric Company operations. The house is a typical worker's home in an old residential area near the steel mills. The new service is required for a new electric range and complete automatic electric laundry equipment. Service conductors on modernization jobs are No. 2 or No. 4. Range circuits are No. 6, dryer circuits No. 10. For water heating another outdoor meter is installed. Most work is handled at flat prices developed out of experience over many thousands of similar jobs. Utility service drop crews cooperate closely with installation schedules.



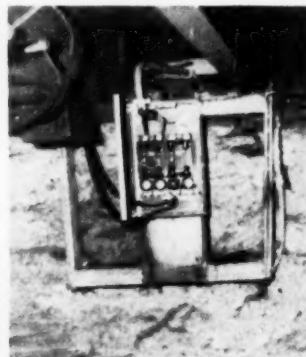
SERVICE MODERNIZATION work on an old house. Original services are usually two wire, No. 8, as shown above. HECO crews with specially equipped trucks make fast work of the changeover. Utility crew is on the way to change service drop.



TWO HOURS LATER, new service of three No. 4's in non-metallic sheath service entrance cable is in place with outdoor meter and new service drop connected. Mechanics are inside working on appliance circuits.



EXISTING SERVICE switch is 30 ampere fused externally operable serving a knob and tube wiring system in dirt-floored basement. Mechanics wear neat uniform work shirts and coveralls with Hale Electric emblem on the back.



NEW SERVICE SWITCH is dead front (cover removed above) parallel main and range pull out 60 ampere capacity two pole fused disconnects and 4 plug fused branches. Additional heavy duty appliance circuits can be added.

the utility, provides new services and major appliance circuits at a uniform price to the customer. When normal installation conditions are encountered, the customer pays \$32.50 for a range installation, \$47.50 for a range and water heater, \$62.50 for a range, water heater and dryer. Minimum service in No. 4 Range circuits are No. 6. The utility acts as a clearing house between the contractor and the customer.

Service entrance cable is used. A new main panel is installed. Range and appliance circuits are terminated at standard plug receptacles of the required rating. Existing circuits are tied into the new panel, but no inspection is required on the existing installation. New wiring is done in accordance with the Code and local ordinances, in each

case a certificate of inspection is issued.

Eight specially equipped trucks and trained crews move out of Hale's headquarters every working day for service modernization work. The organization averages about 200+ installations a month throughout the year. Hale Electric Co. operates as an IBEW shop. Their efforts to maintain exacting standards of workmanship and scheduling within the lowest practical price has full union cooperation.

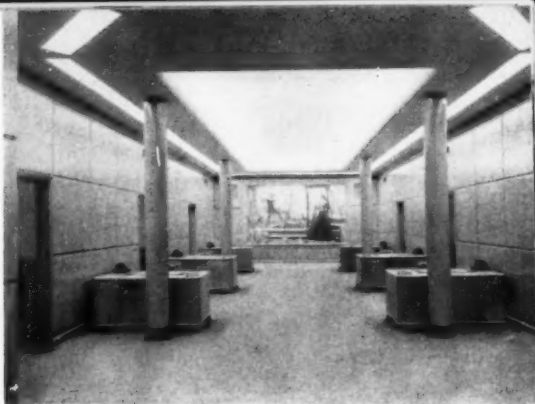
Residential wiring standards are closely linked to utilization requirements in new houses and old. The need for good wiring runs through every level of society. In Pittsburgh, the appearance of workers' homes crowded in grim rows contrast sharply with the plush new suburbs. But electrically

both these sections share identical requirements.

When your reporter rode out with Hale's Bill Riester to catch one of the modernization crews in action, the bright red truck with the square HECO emblem was parked in front of a typical steel worker's home; old and weather beaten. The house stood with its porch crowded against the sidewalk, a narrow path separating it from its identical neighbor on each side. But inside, in a cozy old fashioned kitchen, gleamed a modern double oven electric range, a huge refrigerator, matched automatic washer and clothes dryer, an ironer and a big picture TV set. They needed, and got, just as good wiring as if it were installed in the most modern suburban home.



CEILING PANELS of semi-recessed type replaced obsolete ornamental units in the Farmers National Bank to provide 25 footcandles of high quality lighting throughout, and to improve the architectural appearance.



COVE LIGHTING and recessed troffers using fluorescent lamps provide 50 footcandles of comfortable illumination and good decorative effect at Fidelity Trust Company. Electrical Contractor—Levinson Electrical Co.

PLANNED

Planned Lighting is setting the pace for progress in Pittsburgh's redevelopment. It is a dynamic, living force in the new and remodeled buildings, in the public and private projects of all types, which comprise the Pittsburgh Renaissance.

By Jos. S. Schuchert, *Manager, Commercial Sales, Duquesne Light Company, Pittsburgh, Pa.*

MORE constructive growth in lighting progress has taken place in Pittsburgh during the past six years than in all its previous history. This growth is as dynamic as Pittsburgh's renovation. In fact, this lighting progress has set an enviable pace for the entire Pittsburgh redevelopment program.

This growth in lighting progress didn't just happen. It is the result of the cooperative efforts of all segments of the lighting industry in Pittsburgh. It is the result of the efforts of qualified professional engineers, architects, designers, manufacturers' specialists, trained lighting men of the distributors, electrical contractors, utility illuminating engineers and others in telling the prospective users of artificial lighting systems all the facts **about proposed lighting installations.** It is a result of the Planned Lighting Program—of the concepts of that program being put into practice.

The Planned Lighting Program principle originated in Pittsburgh. It was first presented to the lighting industry in 1946. It spread nationally. Since then, its concepts have been put into practice, both in Pittsburgh and nationally.

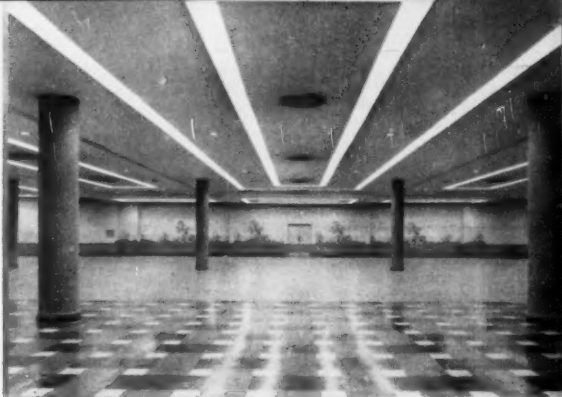
Results of the Pittsburgh Planned Lighting activity are phenomenal. More than 10,000 lighting installations have been made since 1946, of which at least 6,000, or 60%, have been good PL jobs. Of these, there have been approximately 300 schools, 350 office, 4,000 store, and 1,350 exterior, industrial and miscellaneous installations.

It is estimated that these PL installations have resulted in the sale of \$10-million in lighting equipment, \$1.5-million in materials, \$4.5-million in labor, and in some 25,000 kilowatts and 50-million kw-hrs. Professional engineering fees and other services have also been substantial.

Planned Lighting in Pittsburgh is providing realistic benefits for its citizens. It is protecting the eyesight of its school children, and aiding them in their learning process and maintaining good posture and good health. It is aiding merchants in making more sales, greater turnover, suitable profits. It is helping factories to produce more goods of better quality, at less cost, and with less spoilage of products. It is improving the efficiency of office workers, permitting more work to be done easier and with less errors. It is creating a better work environment for workers in stores, offices and factories, and aiding in the maintenance of high worker morale. And it is improving living conditions in the homes, hotels, clubs, restaurants, and for the places where people live, work and congregate. Planned Lighting is good lighting. And good lighting is a dynamic factor in the history and growth of Pittsburgh.



LUMINOUS PANEL and two troffers, both recessed and equipped with fluorescent lamps, light the Board of Directors room at Equitable Gas Co. to 60 footcandles. Electrical Contractor—Frame Electric Co.



RECESSED TROFFERS in rectangular patterns are combined with recessed incandescent reflectors to provide 60 footcandles in the banquet room at Syria Mosque, Oakland Section. Electrical Contractor—Morganstern Electric Co.

LIGHTING in Pittsburgh



LOW BRIGHTNESS type troffers recessed in acoustical ceiling provides comfortable lighting for young eyes in library at Avonworth Union High School. Intensity is 60 footcandles. Electrical Contractor—Reno Electric Co.



TWIN 750-WATT industrial-type incandescent reflectors provide 60 footcandles of diffuse illumination over basketball court at University of Pittsburgh Field House. Electrical Contractor—Sargent Electric Co.

LOUVERED SECTIONS supported on T bar framework below fluorescent lamps provide large area luminous section in marquee of Nixon Theatre to attract customers. Electrical Contractor—Levinson Electrical Co.



LUMINOUS CEILING in Fayette Room of Sheraton Hotel extends from wall to wall, is formed of 4-ft. by 5-ft. sections of corrugated Plexiglas, provides 33 footcandles of cheerful, diffused lighting on banquet tables.



Planned Lighting in Pittsburgh (continued)



LOUVERED BOX UNITS recessed in ceiling each contains 12 40-watt fluorescent lamps and provide 60 footcandles of general illumination in sales area at Gimbel's Department Store. Electrical Contractor—Carter Electric Co.



FLUORESCENT TROFFERS and incandescent reflectors recessed in ceiling provide 65 footcandles of general lighting at Joseph Horne Co's. Brentwood store. Wall and show cases are also lighted. Electrical Contractor—Ferry Electric Co.



FLUORESCENT AND INCANDESCENT lighting units are combined in this well-planned system to provide 100 footcandles of sparkling brilliance at D. H. DeNardo & Co's. jewelry store in Braddock, Pa. Electrical Contractor—Harry Kramer.



CONTINUOUS ROWS of suspended fluorescent units containing incandescent spotlights at intervals provide 80-100 footcandles of display lighting in salesroom of Don Allen Chevrolet Co., Shadyside. Electrical Contractor—Kurt Alexander.



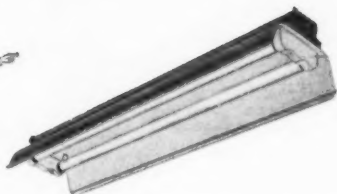
INDIVIDUAL FLUORESCENT 2/40-watt reflector units light 220,000 sq. ft. floor area at Keystone Box Co's. plant, Sharpsburg, Pa., to an intensity of 50 footcandles. Reflectors are open end type, installed 13 feet from floor.



HIGH BAY industrial reflectors are equipped with 1000-watt mercury vapor lamps and installed in five rows at roof truss level to light a large production area in the Westinghouse Electric Corp's. East Pittsburgh plant.

NOW YOU CAN OFFER AT NEW LOW PRICES

NEW
LOW PRICES



IMPROVED
PERFORMANCE



ALL-AROUND LIGHTING IMPROVEMENTS

LOW
MAINTENANCE COSTS



IMPROVED
DESIGN



with Sylvania's New Industrial Fixtures

Announcing 222 New Industrial Fluorescent Fixtures at an amazingly new low cost. All are engineered to meet every lighting need in any type plant for any level of illumination. Customers make additional savings since new design also cuts maintenance costs.

Reasons for Sylvania's flexibility and lower cost

Simplified designing is the basic reason for the success of this new line. With one skillfully engineered reflector and two top housings, Sylvania lighting experts have developed "family" groups of 24 standard fixtures each. These, with optional variations, making up 222 different types, offer a variety and flexibility never before possible.

And, because this line requires comparatively few different parts, die costs and assembly costs are held way down. These savings are now passed along to you in lower prices.

You'll want all the facts about this splendid new fixture line. The coupon brings you new folder and data sheets for your file.



Display this sign on your windows. It identifies you as the Lighting Contractor equipped to offer the finest service and finest fixtures . . . SYLVANIA.

MAIL THE COUPON NOW!

SYLVANIA



FLUORESCENT TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT BULBS;
RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC
TEST EQUIPMENT; PHOTOLAMPS; TELEVISION SETS



Sylvania Electric Products Inc.
Dept. L-2705, 1740 Broadway
New York 19, New York

Please send me illustrated folder and data sheets
on the new line of Sylvania Industrial Fixtures.

Name

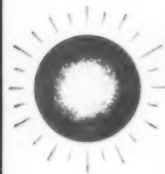
Street

City Zone State



START

using CLARK Bulletin 6018 and 6020 Type "CY" Combination Starters which combine a Safety Switch or Circuit Breaker and Motor Starter in one cabinet.



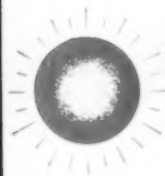
STOP

the extra cost of installing and wiring separate Safety Switches or Circuit Breakers with Motor Starters.



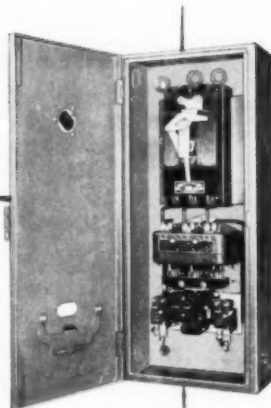
START

saving time and insuring production by using CLARK Type "CY" starters for your AC motors.



STOP

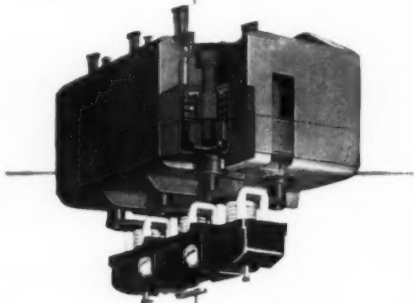
high cost caused by time out for maintenance and repair.



CLARK Bulletin 6020 Size 2 Type "CY" Magnetic Combination Motor Starter with Circuit Breaker.

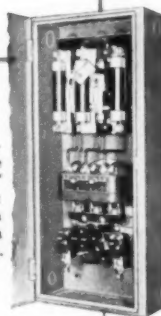
All New Design

Clark Type "CY" Starters Sizes 2 and 3 are equipped with strong multi-turn magnetic blow-out coils and twin-break contacts. Contacts are of a special silver alloy selected for its high melting point, non-welding and arc-quenching properties. Contacts require no cleaning.



New Arc Quenching Principle

The arc in Type "CY" starters Sizes 2 and 3 is extinguished by the effect of the blow-out coils, *concentric with the contacts*. The steel arc chamber and center stud (colored green in sketch above) form the magnetic field which rotates the arc—either lengthening or confining it. Since the arc moves continuously on the contact surfaces, burning and pitting is minimized and contact life greatly increased.



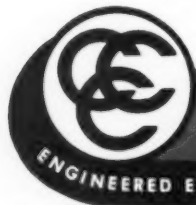
CLARK Bulletin 6018 Size 2 Type "CY" Magnetic Combination Starter with Safety Switch.

CLARK

Type "CY" starters are engineered and built for rugged service—for more time "on the job" and less "time out for repairs and maintenance."

Available in all types of enclosures to meet every industrial requirement.

Available Through **CLARK** Distributors.



THE CLARK CONTROLLER CO.

ENGINEERED ELECTRICAL CONTROL • 1146 EAST 152ND STREET, CLEVELAND 10, OHIO

Practical Methods

Troffer Beams Support Multiple Facilities

CONSTRUCTION

The Austin Company's recently enlarged and modernized eastern operations center at Roselle, New Jersey, utilizes an integrated ceiling installation

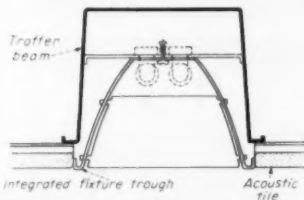
to support a fluorescent troffer lighting system, air conditioning ducts, sprinkler pipes and acoustical ceiling tiles. The fundamental element in the



BEFORE MODERNIZING the Austin Company's eastern operations center, roof trusses were exposed and lighting fixtures were rod-supported from the purlins. These fixtures were lowered, then raised again into the load-supporting troffer beams.



INTEGRATED CEILING supports fluorescent lighting system, air conditioning ducts, sprinkler pipes and acoustical tile ceiling without auxiliary hangers or supporting framework. Benefits in weight, maintenance, installation and cost were derived from the use of this ceiling system.



KEY ELEMENT in the integrated ceiling is a heavy gauge sheet steel troffer beam, inside of which the lighting fixtures are supported. Beams support all overhead power, lighting and service utilities; eliminate other hangers and supports.

integrated ceiling is a load-bearing troffer beam formed from heavy gauge sheet steel. Since the beams can safely support concentrated loads of half a ton or more, they can carry all overhead facilities without the necessity of installing auxiliary hangers or special framework. With troffer beams secured to roof trusses by means of clamps, and with steel nailing channels or inverted T bars fastened between troffers at right angles to support ceiling panels, the completed ceiling is lighter in weight, simplified in construction, easier to erect and maintain, adaptable for flexible lighting plans and ideally fitted for carrying building services. (See complete discussion in *EC&M*, August, 1951, page 44).

Since the operations center had a troffer lighting system prior to the installation of the integrated ceiling, it was only necessary to lower the existing fixtures, install the new structural load-supporting troffers, then raise the original lighting units again so that they fit inside the heavy-gauge trough-like channels. Air conditioning ducts, sprinkler pipes and acoustical tile were then placed in position and the entire area was repainted to complete the transition of the open-truss factory-like structure to a modern engineering office.

In raising the troffer beams for bolting to the building roof trusses, a motor-operated lift was used. The lift was formed by fastening two extension arms and related lifting mechanism to a standard tubular steel scaffold. Troffer beams were lifted to the supporting arms of the scaffold hoist; an operator motivated the lift by push-button control. The channels were raised into position and two other mechanics bolted the troffers to the underside of the 60-foot trusses.

*When Life's at
Stake Rely on...*

KLEIN



Show the familiar Klein trademark to the old-timer on the pole and he'll tell you—"that's the equipment I've been using ever since I was a grunt."

Yes, workmen just naturally feel safer when the equipment is Klein—recognized for quality "Since 1857."

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York.

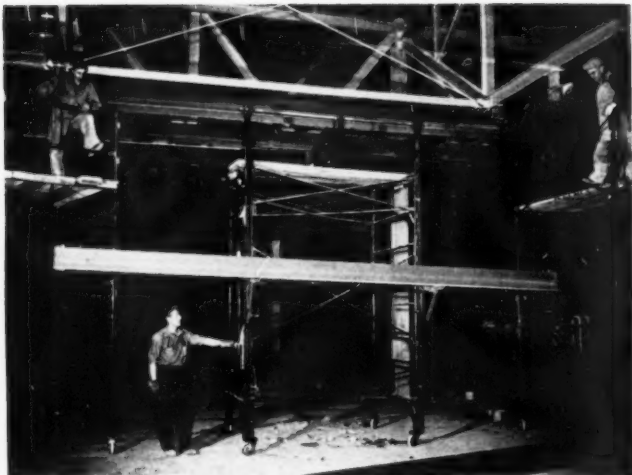


Write for your free copy of the Klein Pocket Tool Guide today!

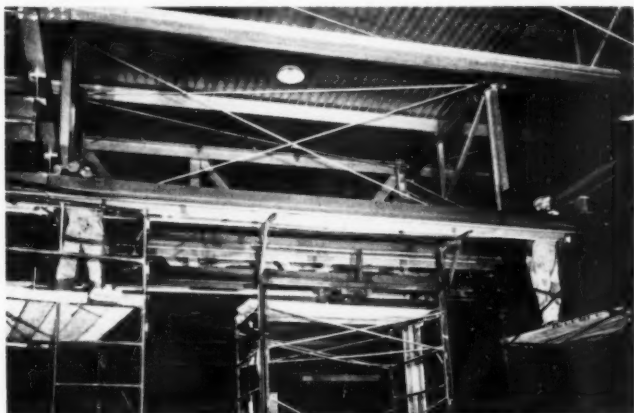
Since 1857



Mathias KLEIN & Sons
Established 1857
2200 BELMONT AVE., CHICAGO 18, ILL.



HEAVY TROFFER BEAMS were raised into position by means of a special motor-operated lift built around a rolling tubular steel scaffold. Pushbutton control facilitated exact regulation of the lifting mechanism.



TROFFERS WERE BOLTED to the building trusses by two operators working on rolling scaffolds. Inverted T bars were then fastened between and at right angles to troffer beams to support acoustical ceiling tile.

This integrated ceiling, doubling as a structural framework as well as serving as a mounting grid for lighting and other services, provides both flexibility and installation simplicity for wiring and equipment. The ceiling, while designed primarily for industrial plants, is also adaptable to offices and other structures where preformed ceilings are installed. The specially-designed trough-like troffer beams may be installed on 3, 4 or 5-foot centers; they may be fastened to bottom truss chords with special clamps to eliminate drilling, they eliminate the conventional maze of supporting rods and framework required for normal ceiling suspension.

Hole Drilling Unit Solves Cutting Problem

POWER TOOLS

When electrical service at the famous Drake Hotel in Chicago was changed over from direct current to alternating current, the rewiring involved installation of more than 170 feeders. Most of them were 3½-inch conduit with four 500MCM cables. Risers to feed the various floors of the hotel were installed in two groups—one on the east end and one on the west end of the building. In both cases, the conduits passed through a wash closet on each floor.



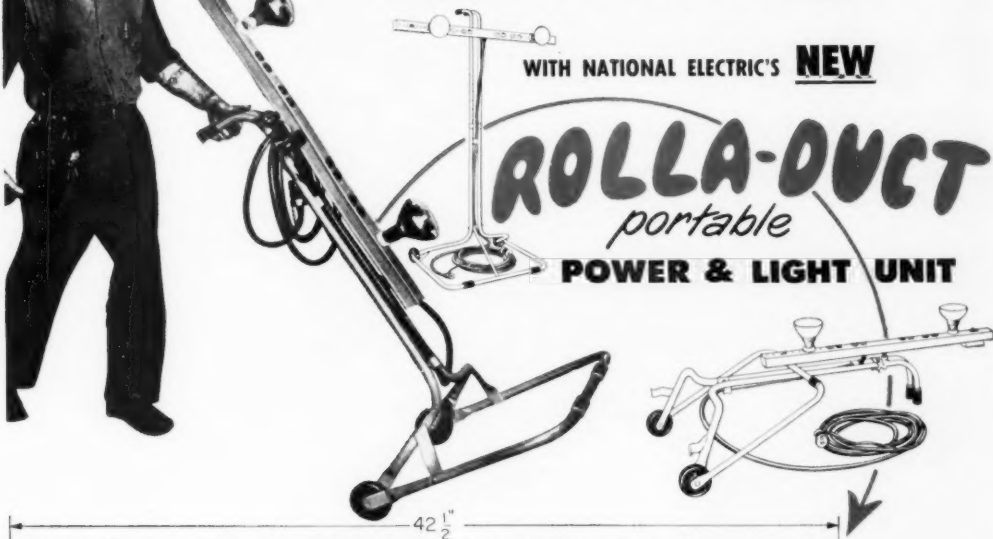
NOW! you can roll power and light RIGHT TO THE JOB

WITH NATIONAL ELECTRIC'S **NEW**

ROLLA-DUCT

portable

POWER & LIGHT UNIT



Circuit Breaker	Flood Lamp Socket	Duplex Twistlock Receptacle	Duplex Grounding Type Receptacle	1700 Surfaceduct	Duplex Grounding Type Receptacle	Duplex Twistlock Receptacle	Flood Lamp Socket	Toggle Switch Controls Lamps

POWER HEAD—CATALOG NO. 17P

Can also be provided with four flood lamp sockets, duplex outlet, and circuit breaker toggle switch (Light Head—Catalog No. 17L).

- Rugged, non-conductive wheels.
- Circuit breaker for full worker protection. Entire unit fully grounded.
- Sturdy, all-steel tubular carriage. May be elevated to 5 1/4 ft. or can be rolled under jobs.
- Power head on ball-and-socket swivel locks into any horizontal or vertical position.
- Heavy duty Indestructo cable—21 ft., three-conductor, #12 A.W.G. power cable. Neoprene jacket resists chemicals, acids and abuse.

Approved for 20 ampere loads, 115 volt operations

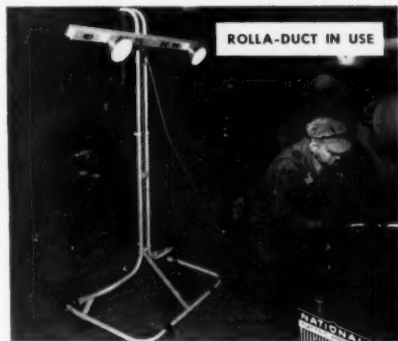
No need to relocate light and power outlets to meet extra demands of assembly lines, temporary lighting or general maintenance. Rolla-Duct supplies light and power wherever the standard wiring system is inconvenient to use.

LISTED BY UNDERWRITERS' LABORATORIES, INC.
SOLD THRU LEADING ELECTRICAL WHOLESALERS

National Electric Products

PITTSBURGH, PA.

Plants in Ambridge, Pa., Torrance, Calif. and Elizabeth, N. J.



ROLLA-DUCT IN USE

EVERYTHING IN WIRING POINTS TO



National Electric Products Corp.
1301 Chamber of Commerce Building
Pittsburgh 19, Pennsylvania

Please send me complete information on Rolla-Duct. I am interested in using it for _____

Name _____

Title _____

Company _____

Address _____

WRITE FOR COMPLETE INFORMATION ON ROLLA-DUCT USE THIS HANDY COUPON



Whips Trouble Spots Throughout Industry

"NEITHER VIBRATION NOR MOISTURE ARE PROBLEMS NOW," SAYS THE RICHARD ORE CO. "We installed 7 Westinghouse Life-Linestarters* in a particularly difficult application, a mine concentrating mill. We were off to a flying start immediately—the Westinghouse Life-Linestarter is easier to install because of straight-through wiring and the arrangement of breaker and starter in a single enclosure. Outages due to moisture and vibration have been virtually eliminated. That had been our biggest headache. 10 more Life-Lines will be installed shortly."

"WE HAVE MORE PROTECTION FROM MOISTURE," SAYS THE ELLICOTT MACHINE CORP. "In dredges and dredging machinery, protection from moisture is of the utmost importance. Your Bonderized* starter cabinets certainly do that job well—we don't worry about it."

"COIL CHANGES MUCH FASTER NOW," SAYS THE BAHNSON CO. "We were curious to know if Life-Linestarter coils actually could be changed faster. A time study was made upon arrival of the first shipment of starters. We're happy to say that coils are not only easier and quicker to change, but there is less chance of damaging other parts."

"EVEN SLAMMED IT WITH A HAMMER," SAYS THE SPRING PERCH CO. "Our plant had one particular machine that vibrated so much the starter units had to be changed from time to time. But your Westinghouse Salesman proved the real strength and durability of the Life-Linestarter. He asked me to slam it with a hammer, which I did. The contacts still remained closed—proof enough for me that this starter could take any vibration."

"STRAIGHT-THROUGH WIRING ANSWERED MY PROBLEM," SAYS THE BAKER REFRIGERATION CORP. "We have a new air-conditioning design that requires the use of two starters. We found that the Westinghouse Life-Linestarter, with no wiring on the back, could be more easily mounted in a group within our enclosure—saves assembly labor. This completely sold me on your straight-through wiring."

Want more information? Simply contact your nearest Westinghouse Representative and ask him for all the facts. Or write for Booklet B-4677, "Tomorrow's Starter Today", Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-30073

YOU CAN BE SURE...IF IT'S

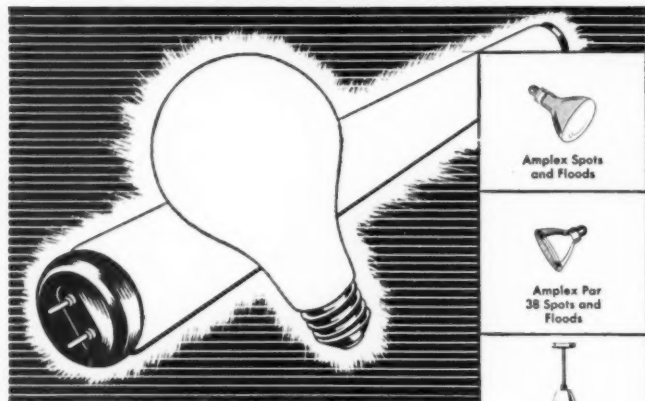
Westinghouse

Life-Line

MOTORS and CONTROLS



NOW MEET EVERY LIGHTING NEED WITH AMPLEX LAMPS



Incandescent and fluorescent general service lamps have joined the Amplex line

HERE'S NEWS! Now you can get top efficiency at least cost on *all* your lighting... by simply buying Amplex straight across the board! Incandescent and fluorescent *general service lamps* are ready to go and the Amplex line is complete from A to Z... a lamp and tube for every lighting purpose.

The new Amplex general service lamps and tubes come in a full range of types and wattages. They're precision-built to Amplex high quality standards... maintain maximum light output throughout their extra long-burning lives.

Solve your lamp problems once and for all. Order Amplex lamps for all of your general and special lighting needs. Write us for the whole story on today's fastest-growing line. **Amplex Corporation, Dept. C-5, 111 Water Street, Brooklyn 1, N. Y.**

AMPLEX

Sealed-Beam Reflector Lamps, Colorbeam Lamps, Spotlights and Floodlights, Industrial Infra-Red Heat Lamps, Vibration and Rough Service Lamps, Street Lighting Lamps, Traffic Signal Lamps, Incandescent Lamps, Fluorescent Tubes, Display Accessories.



Amplex Spots
and Floods



Amplex Par
38 Spots and
Floods



Amplex
Swivelites



Amplex Hi-Bay
Reflector Lamps



Amplex Mercury
Vapor Lamps



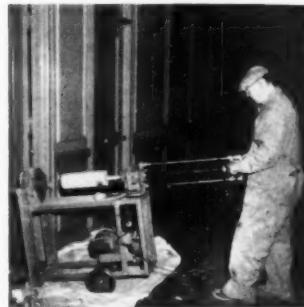
Amplex
Infra-Red Lamps



Amplex
Colorbeams



HOLE BORING UNIT is set to drill conduit opening in concrete slab.



UNIT CAN BE ROLLED from floor to floor and room to room.

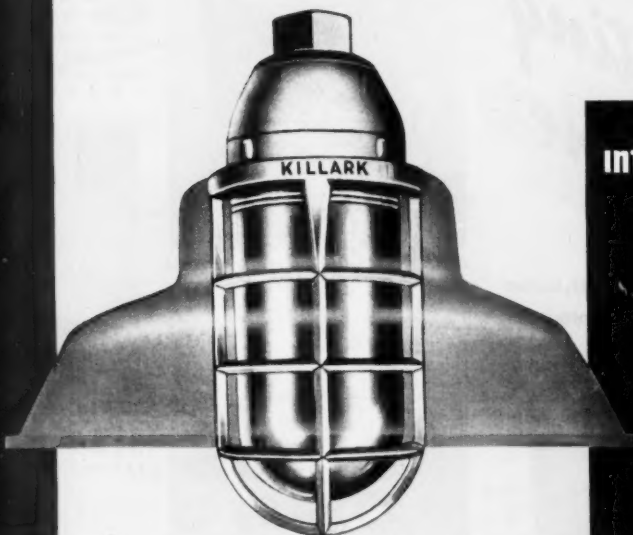
Passage of such a large number of conduits through the floor slabs posed somewhat of a problem because the building was a hotel. Excessive noise could not be tolerated because of guests who might be in their rooms at any time during the day or night. Consulting engineer Ralph H. Decker, Chicago, who drew up the plans and specs, left choice of method to Fischbach, Moore & Morrissey, electrical contractors on the project. Decker's and management's stipulation were that noise be kept to an absolute minimum.

Because of the nature of the installation, compressed air drills, electric hammers and the old standby—bull point and sledge hammer, were ruled out. The floor slabs ranged from 8-in. to 12-in. thick with unusually tough aggregate and were criss-crossed with reinforcing steel rod.

F. M. & M. solved the problem of cutting several hundred openings by using two portable hole boring ma-

KILLARK'S SIMPLIFIED DESIGN

OFFERS SIMPLE INSTALLATION and MAINTENANCE!



COMPLETE INTERCHANGEABILITY



TYPE VB-1



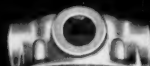
TYPE VGC



TYPE VGH



TYPE VGL



TYPE VGT



TYPE VGX



TYPE "VA"

Killark VAPOR-TIGHT LIGHT FIXTURES

Fewer construction parts obviously mean fewer replacements or repairs. Killark Vapor-Tight Light Fixtures are accurately die cast and scientifically assembled from a minimum of parts. The result is a fixture that effectively excludes such ordinarily troublesome atmospheres as rain, moisture, smoke, spray, ice, snow and dust . . . a fixture that can be quickly serviced or relamped *without tools*.

The *complete interchangeability* of the individual Killark parts provides a new economy as well as a ready adaptability to your *specific* lighting needs. Every type of installation—whether it be a bracket, pendant, ceiling or corner mounting—is possible with a *minimum inventory*, when you specify Killark.



Killark

ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Aves.

St. Louis 13, Missouri

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When ordering high voltage
cable splicing materials
separately...

*you're
Wasting
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there is a quicker, simpler, better
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**THE G & W SPLICING KIT
is the TIME SAVING WAY**

SIMPLY give us complete cable data
and you receive a neat package
with adequate quantities of all materials
for a properly designed joint.

*You save time
and money because...*

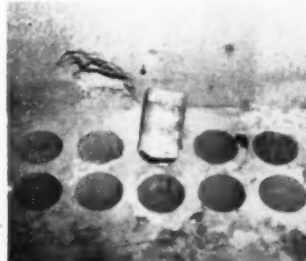
No lengthy material specifications
are necessary. Both design and installation
methods can be standardized. All joints
are properly designed to industry standards
by expert cable engineers. Each kit packed
in convenient size box. Easy to store,
identify and handle. Individual kits issued
directly to workmen in original shipping
cartons. Easy to quickly estimate costs
for any particular job.

**WHEN ORDERING SEND
COMPLETE CABLE DATA**

G & W ELECTRIC SPECIALTY CO.
7780 Dante Ave., Chicago 19, Ill., U.S.A.
Representatives in Principal Cities
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DRILLING A GROUP of openings within
the confines of small wash closet in the
hotel.



FINAL RESULT: ten clean-cut, 4 1/2-in.
diameter holes in a tough 8-in. thick-
slab—all within a 15-in. by 33-in. rec-
tangle.

chines, one for each riser shaft area.
The Howe-Simpson portable abrasive
speed drills, powered by a 1-hp motor
drive, cleanly cut 4 1/2-in. diameter
holes (for 3 1/2-in. conduits) through
the toughest slab including any steel
rods or conduits that might have
been encountered. Once the unit was
positioned and started, the mechanic
applied pressure to the drill tool post
until the hole was through. Although
greater care was necessary in laying
out the openings, the demand on a
mechanic's muscle-power was prac-
tically nil.

The units did a clean-cut job in the
confines of the 6-ft. by 7-ft. wash
closets on each floor. No chipping
was apparent around the top of the
drilled opening and only slight chip-
ping (depending upon obstructions
hit near the bottom) on the under-
side. When operating, the drilling
machine noise level (that could be
heard by guests in rooms or corridors)
was approximately that of a muffled
vacuum cleaner.

Both management and the engineer
were pleased with the relative speed
and quietness.

**Pry-Out Cover Spots
Outlets In Plaster**

WIRING

Electrical contractors need worry no
longer about sounding, tapping and
probing plaster walls for hidden outlet
boxes—or cleaning out boxes and con-
duits clogged with plaster. One of
their fellow contractors has solved
their problem.

P. J. Falson of Falson Electric Co.,



A SCREWDRIVER IS inserted in the ac-
cess hole of the "knob" on the Outlet
Lo-kator. Then



CENTER PLATE retaining lugs are broken
by lever action on screwdriver and plate
slips into box. Finally



PLATE IS REMOVED with screwdriver
shank, exposing a perfectly clean outlet
with a smooth plaster border.

COBX
For Metallic Cable

COB-1/2
For Conduit

COBLX
For "Flex"

3

RACO boxes that give twice as much wiring space...

These RACO electrical boxes handle double the capacity of the usual box — as many as *eight* number 12 wires — at a cost of only a few cents more. Think what this means in extra wiring space and reduced cost. Here is another example of the installation speed, convenience, and economy that are found in RACO electrical boxes. They are available nationally.

You can always rely on RACO

RACO

ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois

"A BOX FOR EVERY NEED"



Stop Trouble

USE **APPLETON**

Friction & Rubber Insulating Tapes



O.K. BRAND
FRICTION
TAPE



O.K. BRAND
RUBBER
TAPE



A trouble-free job always requires top quality products . . . and in tape, electrical contractors give their O.K. to O.K. Brand Friction, and Rubber Insulating Tapes. Ask your wholesaler for O.K. Tapes . . . the choice of the electrical trade!

SOLD EXCLUSIVELY THROUGH WHOLESALERS

APPLETON RUBBER CO., INC.

BOSTON 30, MASS.

O. K. IN EVERY WAY

Chicago, does a considerable volume of residential and commercial wiring. Time after time he became irritated at the unnecessary expense of having electricians chop out hidden outlets or clean out plaster clogged boxes and conduits. Finally, he decided to remedy this situation once and for all. After considerable study and experimenting, Falson designed and patented a conduit box cover that:

1. Permits plasterers to apply an even coat around the outlet cover, yet prevents plaster from being forced into the box.

2. Permits trim crew electricians to quickly locate the outlet.

3. Has a removable center protector plate which can be quickly and easily pried out with a screwdriver, leaving a clean outlet with a smooth, even plaster border.

4. Saves time and expense by eliminating chopping and patching of plaster around outlet boxes.

5. Combines a plaster cover and protector plate in a single item, thus simplifying inventory problems.

Feature of the new box cover is the pry-out center protector plate with its bell-shaped protrusion and access hole which extends about one-half inch beyond the cover (and plaster) surface. Normally, this center section is scrap metal punched out during the stamping operation on conventional covers. In the new design, it remains in place (held by two small metal lugs) as an outlet locator and box enclosure.

Removing the pry-out plate is a simple operation. After spotting the outlet by the protruding "knob", the electrician scribes the plate outline with a screw driver to prevent flaking of the border plaster. Then, he inserts the screwdriver in the access opening and moves it up and down (as a lever) a few times to break the retaining lugs. The plate comes off to expose a perfectly clean outlet box.

Because he operates in an all-metal area (conduit and electric metallic tubing for all wiring), Falson naturally developed his "Outlet Lo-kator" covers for conduit boxes. They are designed as an all-purpose cover to fit both the 8-B (ceiling octagon) and 1900 (4-inch square) boxes.

A recent demonstration in a home under construction in suburban Chicago proved the feasibility of the new idea. Contractor Falson had his men install a limited number of sample covers on outlet boxes. After the plastering was completed, he invited top officials of the home builders, electricians, plasterers, contractors and electrical inspection groups to "see for themselves." General consensus among those present was that this was the answer to the problem.

Labeling Tape Identifies Circuits

—WIRING

The Howard P. Foley Company, electrical contractors, Pittsburgh, Pa., makes it easy for its mechanics to identify lighting and power circuits when conductors are pulled in and connected. Electricians on this type of work carry a roll of moisture and smudge-proof, pressure sensitive, cellulose tape on which circuit numbers can be written with a pencil, stylus or similar item.

After the conductors have been connected, the electricians merely tear a length of tape off a handy plastic dispenser, apply it to the wires and inscribe the proper circuit identification on the tab. It's all accomplished in a matter of seconds. There is no fumbling and sorting of numbered tabs to secure the right combination for specific circuit identification.

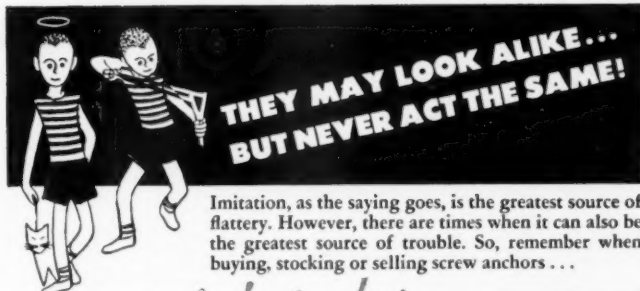
Known as "Labelon", this tape uses the same principle as the child's magic slate. It consists of a strip of waxy



TAPE TABS identify lighting circuits on a large office building electrical construction project. Circuit numbers written on white portion of tape cannot be obliterated. Method saves considerable time.

white substance on a black background sandwiched between two layers of cellulose films and has a strong adhesive backing. Writing on the white strip with a pencil or stylus indents the white substance to produce a clear, black, non-erasable impression impervious to water, oil, dirt and smudging.

Foley mechanics also used this tape on switches and other pieces of electrical equipment for preliminary or permanent identification purposes. It is easy to apply, easy to remove and can be reapplied several times if desired.



Imitation, as the saying goes, is the greatest source of flattery. However, there are times when it can also be the greatest source of trouble. So, remember when buying, stocking or selling screw anchors...

Substitutes

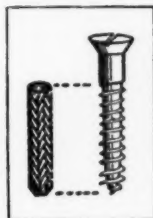
CAN PROVE DANGEROUS!

The word "Rawlplug" used in connection with *Jute Fibre Screw Anchors* is exclusively the property of The Rawlplug Company, Inc. For forty years it has been secured to them by common law and by trademark registry. It is the corporate and trade name of the company and specific product of their manufacture.

BE SECURE BY BEING SURE

Look for the Trade Name

RAWLPLUGS
on the Blue Box



See us at Booth 253
Triple Industrial Supply Convention
Atlantic City, N. J. — May 19 to 21

RAWLPLUGS because of their chemically treated braided jute fibre construction... Hold Better... Last Longer... Weigh Less and Hold More! They... Eliminate extra troublesome spotting and layout work. Rawlplugs are the only universal anchors which can be used in any material.

"IF YOU DON'T USE **RAWLPLUGS**... THERE'S A SCREW LOOSE SOMEWHERE"

For further information write Dept. E

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THERE ARE RAWL PLUGS, EXPANSION BOLTS, SCREW ANCHORS AND MASONRY DRILLS FOR EVERY NEED.
SOLD THROUGH ALL LEADING HARDWARE, ELECTRICAL AND MILL SUPPLY HOUSES



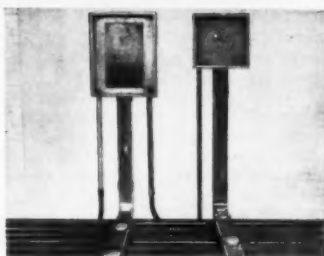
1. FLOOR AND RACEWAYS, ALL IN ONE, are laid when Q-Floor goes in place. This modern flooring provides an over-all working platform, offers an ideal series of raceways. The hollow, tube-like cells of Q-Floor make the entire floor available for electrical distribution. Electricians can wire quickly and easily.



HERE ARE 5 EASY STEPS to complete electrical flexibility



2. HEADER DUCTS GO IN at right angles, across the floor cells. These ducts are the main distribution fittings. They bring the wires from the load centers and make them accessible to the floor cells. Separate headers are used for telephone, signal, and power systems. Note the large, easy-to-use handholes used for running circuits through to the particular cells they feed.



3. HEADER DUCTS are connected to panel boxes by means of special cills and panel ducts. These ducts provide adequate capacity for present, as well as future, wiring. When these ducts are coupled to the headers, your Q-Floor distribution system is complete, ready for wiring. After the floor has been poured, you can run in circuits rapidly to any floor area.



4. Q-FLOOR WIRING is fast and easy. There are eight possible outlet locations in every square foot of floor area. The electrician merely spots the location of the needed outlet and drills through to the Q-Floor cells beneath. With this simple operation, the raceway is open and ready for wires to be pulled through from the header duct. Access to the header duct is simply a matter of removing the proper handhole cover.



5. OUTLETS ANYWHERE, ANYTIME. General Electric Q-Floor wiring is as flexible in years to come as when installed. Adding circuits or rewiring involves no ripped up floors, no disruptions of business. The location of any raceway can be determined easily at any time. An adjustable floor tap with extension makes outlet installation a matter of minutes. With Q-Floor wiring, buildings stay electrically young.

YOU CAN OBTAIN A PLANNING BOOKLET on General Electric Q-Floor wiring—the system that gives building operators full opportunity for full use of electrical equipment. For your free copy simply write on your letterhead to Section C11-518, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

GENERAL ELECTRIC

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For further information on new products, trade literature and advertising appearing in this issue—

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Product News



Fluorescent Mercury Lamp (1)

To meet the trend toward larger manufacturing spaces, higher mountings and higher lighting levels both indoors and outdoors, a new 1000-watt, C-H12 fluorescent mercury lamp has been made available. Similar to the 400-watt J-H1 lamp, this new light source provides a golden white light suitable for all types of lighting service except those where close color discrimination is involved. Its ballast is the same as that used for the 1000-watt, A-H12 lamp, and its BT-56 bulb has a specially developed isothermal shape that allows the phosphor coating to function at maximum efficiency. When activated by invisible ultraviolet light from the quartz arc, the phosphor gives off red light. This blends with the blue-green-white light from the mercury arc to give a golden white light with approximately the same color quality as a mixture of equal wattages of mercury and incandescent light. Inside frosting of bulb provides better diffusion of light and greater uniformity of color. When used outdoors, fixtures should be designed to protect the bulb from a driving rain or moisture-laden insects.

Westinghouse Electric Corp., Bloomfield, N. J., Lamp Division.

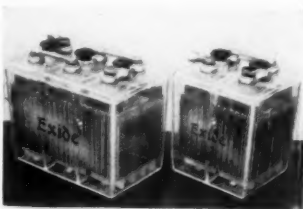


Magnetic Brake (2)

A new magnetic brake design that eliminates all levers and linkage, has been developed. Brake contains 6 major operating parts and features

a direct, automatic set and release action between solenoid and armature. Solenoid is of a one-piece "doughnut" design that permits motor's output shaft to extend through brake. This permits user to utilize both ends of motor shaft for powering two pieces of equipment when desired. Also ideally suited to fluid coupled motors and gear reducers because of this feature. Brake is installed on output shaft of fluid coupling with the shaft extending through the brake for hook-up to load. Lining wear is automatically compensated for by spring tension. Direct action between solenoid and armature, instead of through levers and linkage, provides instant set and release. Brakes are available in 3, 10 and 25 foot pound continuous duty ratings—15 and 35 foot pound intermittent duty types.

Reuland Electric Co., Alhambra, Calif.



Storage Batteries (3)

A new series of storage batteries of two- and three-cell construction for stationary applications are now available. Designated as Exide Type PLX, the batteries are in transparent polystyrene plastic cases designed to show at a glance the level of the electrolyte and approximate state of charge. Markings on case indicate recommended high and low electrolyte levels. Built into each outer cell is a chamber in which a red, a white, and a blue ball float in electrolyte when the battery is fully charged. When it is 10% discharged the blue ball sinks. When it is one-third discharged the white ball sinks, and when two-thirds discharged the red ball goes down. An automatic venting device of clear polystyrene is built into each cell to prevent gas accumulation. The two-cell batteries have a 50-ampere hour capacity at the eight-hour rate, and the three-cell units have a 106-ampere hour capacity.

Electric Storage Battery Co., Box 8109, Philadelphia 1, Pa.



Lighting Fixture (4)

A new explosion-proof lighting fixture has been introduced. Available in sizes ranging from 60 to 500 watts, it is listed by Underwriters' Laboratories, Inc., for Class I, Groups C and D, hazardous locations. It has full circle venting by the use of the entire lower edge of the hood as a continuous louver. This feature, combined with porous metal interiors, provides even heat distribution, and cooler operation. Wire-free canopy construction permits instant removal of entire fixture. By exchanging clean, freshly lamped fixture units for those taken down, maintenance men can perform actual relamping and cleaning at work bench. To safely confine arcs, five full threads on canopy are engaged whenever contact is made or broken. Canopies are standardized to take any fixture in the AA-51 line without re-wiring.

Appleton Electric Company, 1701-59 Wellington Ave., Chicago 13, Ill.

Ballast (5)

Two-lamp Circline fluorescent fixtures using a 22-watt and a 32-watt Circline lamp now can be powered with one "trigger-start" ballast. The new unit (ballast No. 89G333) offers two-lamp, trigger-start operation of one 12 in. and one 8½ in. Circline lamp. It provides instant, simultaneous starting of both lamps. It is smaller than conventional switch-start ballasts for the same lamp combination. It provides quiet operation. Ballast weighs 3½ lbs, measures 8½ in. by 2½ in. by 1½ in., and operates on 110-125 volts, 60 cycles.

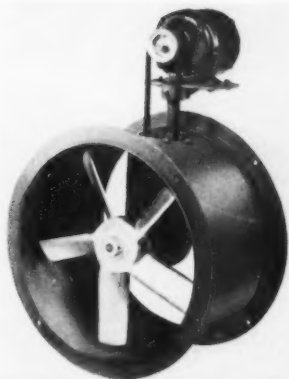
General Electric Company, Schenectady 5, N. Y.



Midwest Electric Mfg. Company

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1024 W. WALNUT STREET
Chicago 12, Illinois



Fan

(6)

For exhausting dangerous or obnoxious fumes, dirt, heat and smoke, and other applications where it is desirable to have the motor outside the air stream, a general-purpose type fan has been introduced. Explosion-proof, enclosed or open type motors are available as required and this unit meets UL specifications for spray booths. Features include sealed SKF bearings in replaceable flange construction, double angle motor support to minimize vibration, adjustable motor base for belt take-up, and cast aluminum fan blade in a wide range of sizes from 18 inches to 42 inches. From $\frac{1}{4}$ to $7\frac{1}{2}$ hp motors are also available.

Standard Electric Mfg. Co., Inc., West Berlin, N. J.



Speaker

(7)

A new small speaker, designed to serve as a re-entrant speaker in low-powered voice paging systems or as a high-efficiency microphone in talk-back systems. Designated MI-6441, it is ruggedly constructed and weather-proofed, making it ideal for use in bus and motor freight terminals, warehouses, loading platforms, coal yards,

garages, and other industrial locations. It has been designed to replace cone-type speakers in intercommunication systems where maximum acoustic output is required from nominally powered amplifiers. Speaker's removable diaphragm unit is enclosed in a weatherproof spun aluminum cover. Mounting arm and throat cell are integrally cast on the base. It has a spun aluminum flared bell and reflector, also mounted on base. A wing-nut locks it in desired position. Speaker has a distribution angle of 120° . Electrical specifications show a power handling rating of 12 watts, sensitivity of 105 db, frequency response of 350 to 10,000 cps, and impedance of 16 ohms. It is $6\frac{1}{4}$ inches long, with a bell diameter of $6\frac{1}{2}$ inches. Speaker weighs $2\frac{1}{2}$ pounds.

Radio Corporation of America, Camden, N. J.



Aluminum Bracket

(8)

A new lightweight aluminum bracket consisting of a cast aluminum base and specially designed aluminum alloy bracket arm that can be folded against the building wall for easier servicing is now available for use with all types of luminaires. The entire assembly weighs 7 lbs. and has an overall length of 52 inches. Bracket is rustproof, and never needs painting. It can be fastened securely to wood poles.

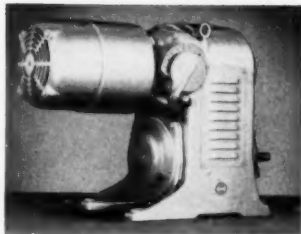
Nepo Manufacturing Company, 527 South Wells St., Chicago 7, Ill.

Insulating Compound

(9)

A new insulating compound, designated HLT 500, suitable for operating temperatures of minus 60°C to plus 120°C has been developed. HLT 500 insulated wires are now available for high temperatures and baking operations such as transformer leads, motor leads, coil and relay leads and for confined areas where excessive temperature build-up has been a problem.

Chester Cable Corp., 521 Fifth Avenue, Chester, New York.



Motor

(10)

Announcement has been made of a combined explosion-proof Varidrive motor. This new design is self-contained, all mounted in one frame, occupying a single base, which saves space and eliminates intermediate connections. Motor element is totally-enclosed and air movement is blasted over the enclosed unit from the exterior by a spark-proof fan housed within the end sector. This motor unit is mounted on the Varidrive assembly. By turning a control dial, change in speed is provided instantly. Motor is available in output speeds from 2 to 10,000 r.p.m. in ratings from 1 to 20 hp. When gear reductions are necessary they are incorporated as an integral unit of the drive.

U. S. Electrical Motors Inc., 200 E. Slauson Ave., Los Angeles 54, California or Milford, Conn.



Heater

(11)

Model PJ-13 portable electric heater for small rooms is now available. Features include cast-aluminum heating element, power cut-off safety switch, and fan for circulating heat or cool air. It has silver grey hammer-tone finish, bakelite carrying handle, rubber feet, chrome nameplate, 6-foot heavy duty cord and plug, and a new grill with louvers pitched to spread the fan-forced warmed air out into the room at floor level.

Electromode Corporation, 45 Crouch St., Rochester 3, N. Y.



John Hancock

took out insurance
against wiring troubles

... with 70 miles of

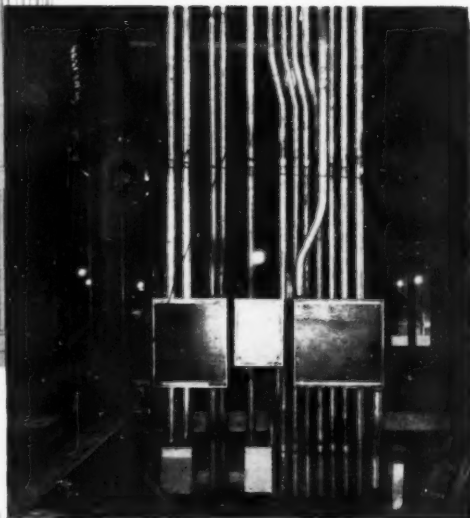
SPANG "CENLACO" CONDUIT

Boston's most modern skyscraper is the home of the John Hancock Mutual Life Insurance Company—and an outstanding example of *good* electrical planning.

Throughout the entire 26 stories there are innumerable, ingenious electrical design features that insure the extra continuity of service and the extra safety to personnel stipulated by the owner. Which makes the 100% use of Spang "Cenlaco" Conduit, from 500,000 CM secondary feeders to circuit runouts, particularly significant.

It's additional evidence of the reliance that prominent owners, contractors and architects place on the uniformity and dependability of quality-controlled Spang "Cenlaco" Conduit.

If *you* need conduit for any purpose, be sure and specify Spang "Cenlaco", "Central Black", "Central White" or "Central EMT". You'll like the consistent high quality—and the ease with which these *better* conduits can be cut, threaded, bent.



OWNER: John Hancock Mutual Life Insurance Co., Boston
ARCHITECTS: Cram & Ferguson, Boston
ENGINEERS: Hixon Electric Company, Boston
GENERAL CONTRACTORS: Turner Construction Company, Boston & New York

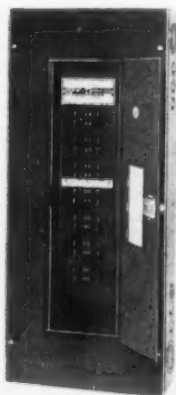




Lighting Unit (12)

Spectro-lite, a new lighting unit using fluorescent tubes in a patented fixture, gives an effect equivalent to daylight by blending red, blue and white tubes. Light produced measures 6,000 Kelvins on the spectra meter, the same color temperature of sunlight. Unit was designed to meet the needs of any operation or display where color register is important. Unit uses standard slimline lamps. Fixtures, which include two red, two blue, and two white tubes each, come in 18, 36 and 96-in. lengths.

John P. Filbert Co., Inc., 2007 South Vermont Av., Los Angeles 7, Calif.



Service Equipment (13)

A new split-bus circuit breaker plug-in, NMO-285, panelette for service entrance applications. It is especially designed to meet the demand for a flexible compact unit to control large electrical loads in homes or commercial installations without the use of a main disconnect. It incorporates a "service section" with 200 ampere main busses and provision for six 2-pole service subdivisions. Two 50 ampere, 2-pole circuit breakers are pre-installed in the service section, each wired to a set of split busses in the distribution section. Distribution section will accommodate a total of 16 single-pole or a combination of single and double-pole lighting or ap-

pliance branch circuits. Four additional 2-pole circuit breakers can be installed in the service section to feed heavy duty loads such as electric range, electric water heater, clothes dryer, garbage disposal unit, electric dishwasher or electric home heating circuits. Circuit breaker units are thermal-magnetic, plug-in type, interchangeable with those of MO load center and NMO panelette lines. NMO-285 panelettes are Underwriter's approved for use as service equipment and comply with the NEC. They are available in flush or surface mounting for 120/240 volt, ac, single phase 3-wire systems.

Square D Company, 6060 Ricard St., Detroit 11, Mich.



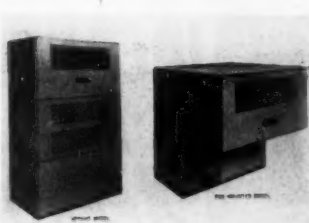
Branded Cable and Cord (14)

Neoprene-jacketed cord and cable with full identifying data at precise two-foot intervals is available. The legend impressed into the jacket includes name "Bronco 60 Neoprene Certified", the type, number of conductors, size, rated voltage, and "PI16BM" — flameproof registration number of the U. S. and Pennsylvania Bureaus of Mines. If you want 20 feet of Bronco 60 Certified portable cord or cable, you count off ten "Bronco's" and cut.

Western Insulated Wire Co., 2425 East 30th St., Los Angeles 58, Calif.

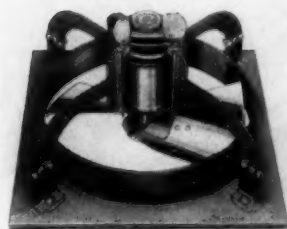
Air Conditioner (15)

A new Unitaire air conditioner, the MU-101 is available. This 10 hp, self-contained unit is ideal for conditioning offices, markets, stores, manufacturing areas, or other applications. Two 12-inch, double inlet fans deliver 4000 cubic feet of air per minute. The fan section, which can be mounted either on top of cooling section or at side, can be rotated to give six different discharge arrangements when it is top-mounted. When mounted at side, five additional arrangements become available, permitting adaptation



of unit to any type installation. The gray-finished cabinet, which is thermal and sound insulated with glass fibre and aluminum foil, is 91 inches high when top mounted, and 61 inches by 32 inches at base. In its side-mounted arrangement it is 62 inches high. Adaptability is provided by accessory heating coils, and unit control is provided by a control board with a selector switch and thermostat adjusting knob.

Westinghouse Electric Corp., Air Conditioning Division, 200 Readville St., Hyde Park, Boston 36, Mass.



Fan (16)

A new direct drive, vertical, propeller fan for exhaust use in kitchens, attics, laboratories, etc., is now available. Designated as model MDA, it is installed flush with the ceiling, the totally enclosed motor and motor mountings being concealed by ceiling itself. Thus the base plate and the fan blade are the only things visible from the room. New fan ranges in blade size from 14 to 36 inches. Motors are available in various current characteristics and differ in horsepower in proportion to the size of the fan. CFM delivery varies from 1,585 in the 14-inch model to 12,400 in the 36-inch fan. When corrosive fumes are being handled, the MDA can be obtained with acid-resisting varnish, capable of withstanding alkali and fumes in moderate concentrations.

Herman Nelson Division, American Air Filter Company, Inc., Moline, Ill.

IDEAL "WIRE-NUTS"

Are Now **FULLY**

APPROVED For **ALL**

"Pigtail" Splices In **ALL** Types
of Branch Circuit Wiring

They're
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A "WIRE-NUT" SPlice IS
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THE EASIEST WAY TO
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76B APPROVED AS PRESSURE
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Please send me free sample of
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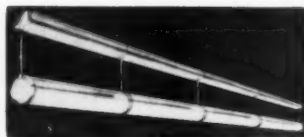
STATE _____

1.
IT TWISTS the
wire ends.

2.
IT THREADS
them.

3.
IT GRIPS
with spring
tension.

4.
IT INSULATES
the splice with
a phenolic plastic
shell that with-
stands 4000 volts
dielectric and air
gap tests.



Lighting Fixture

(17)

A new enclosed luminous indirect luminaire, known as PBM, has been introduced. This unit was developed by a group of engineers at MIT for use in school classrooms, drafting rooms and offices. Units are designed for two 40-watt fluorescent and 40-watt and 60-watt slimline lamps, and can be installed as single units or continuous fixtures of any length. A wireway fastened to the ceiling supports the ballasts and "A-J" adjustable hanger stems. The snap-on wireway covers allow easy access to the ballasts for servicing without disturbing the rest of the fixture. Each "Plexiglas" cylinder section consists of two pieces. The lower half is of diffuse plastic with upper half of clear plastic. Standard hanger lengths position fixture approximately 21 inches from ceiling to top of plastic cylinder. Shorter stems can be supplied on special order. Fluorescent fixture sections are furnished wired and include No-Blink type starters, sockets and Tulamp HPF ballasts. Slimline fixtures are furnished wired with sockets and 430 ma HPF ballasts. All ballasts are designed for 118-volt, 60-cycle, ac operation. Fixtures are approved by Underwriters' Laboratories.

Day-Brite Lighting, Inc., 5402 Bul-
ler Ave., St. Louis 7, Mo.

Balancing Machine

(18)

A low cost shop balancer, known as the Raydine "595", has been added to this line of dynamic balancing machines for industrial production. It offers a simplified shop method of indicating unbalance in rotating parts weighing up to 100 pounds without the necessity of making specially fitted bearings, adapters or universals. These are eliminated by the V-type bearings employed in the machine. The point on the work needing weight correction is indicated by an instant flashing stroboscope. It is a floor model designed expressly for repair shops with a wide variety of balancing work. Operating speed may be varied by changing the pulley size on the motor or by ordering the machine with a variable speed motor.

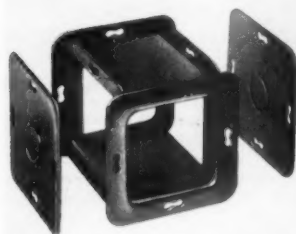
Welch Manufacturing Co., 920 West
Laurel St., Springfield, Ill.

New Type Askarel

(19)

A new improved askarel for power transformers, and load centers has been developed. The new 1470 Pyranol has improved technical characteristics, such as lower viscosity at lower temperatures and a lower pour point, allowing easier handling and application under adverse weather conditions. Advantageous qualities of the Company's earlier 1467 Pyranol have been retained in the new product, including non-inflammability. Use of askarel in power equipment eliminates the necessity of fireproof vaults and long secondary runs of copper.

General Electric Company, Schenectady 5, N. Y.



Junction Box

(20)

A new 2½ inch by 2½ inch flanged wireway junction box has been introduced. The U.L. approved box can be used in place of elbows, tees and crosses in addition to its customary use as a junction box. It features brake-formed heavy gauge steel construction. Two removable closing plates provided with knockouts are included. All holes required for assembly are pierced.

Keystone Manufacturing Co., 23328 Sherwood Ave., Center Line, Mich.

Plastic Tape

(21)

A new calendared tape, known as Tenflex 105, possesses excellent chemical resistance and high dielectric strength. The oil resistance makes the tape a natural selection for use with oil, as in transformers or diesel equipment. The high tensile strength makes its use on taping machines more effective and although the material is not easily stretched, it possesses good ultimate elongation. Being calendared, it possesses perfect uniformity of thickness, which eliminates internal stresses caused by uneven tensions in the wound pad.

Irrington Varnish & Insulator Co., 6 Argyle Terrace, Irrington 11, N. J.

IDEAL Wiring Tools Speed the Job and Cut Costs!



Stripmaster

(Patented, No. 2,523,936)

WIRE STRIPPER

Six models handle all wire gauges — 8 to 22 — solid or stranded, also POSJ. Blades are interchangeable in all models.

Ends wire waste and damage and prevents cut fingers. A single light squeeze strips wire up to full 7/8 inch. "Automatic" feature positively prevents crushing of wire. Just insert wire, squeeze and release. Jaws then snap back, ready for the next squeeze. Precision built for dependable performance. Weighs just 10 Oz.

Coil-Flex FISH TAPE

(Pat. Pending)



Pays for itself over and over in time savings! Can't stick or bind in any conduit. Steel spring wound around rust-proof cable goes easily around 90° bends. Factory tested for 400 lbs. pull. 25-foot lengths quickly join into longer tape.

B-X CABLE CUTTER



Easiest way to cut B-X. Just snip, twist B-X and pull it apart! Cuts two or three-wire No. 10, 12 or 14 armor cable, large or small diameter. Blades removable for sharpening. Cuts anywhere along length of cable.

CABLE RIPPER



For use on non-metallic sheathed cable or lead covered cable. Cuts cleanly, easily and quickly in one operation. Simply squeeze onto cable and pull.

Graduated holes in cable ripper also serve as wire gauge.

VOLTAGE TESTER



Not ordinary "glo" type. Actually indicates nominal voltages from 110 to 600 AC or DC. Has BOTH a solenoid voltage indicator on calibrated scale and a neon test lamp. Prods heavily insulated.

IDEAL WIRING TOOLS
ARE SOLD THROUGH
AMERICA'S LEADING
DISTRIBUTORS



FREE CATALOG
DATA

IDEAL INDUSTRIES, Inc.
1041 Park Avenue, Sycamore, Illinois
Please send catalog information
on IDEAL Wiring Tools.

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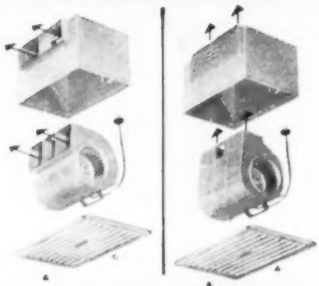
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The Best IN KITCHEN VENTILATION

EXCLUSIVE IN TRADE-WIND VENTILATORS



INTERCHANGEABLE DISCHARGE

On-the-job interchangeability of the discharge opening on **TRADE-WIND** ventilators provides 3 outstanding advantages. This is a patented **TRADE-WIND** feature which eliminates all extra parts.

- 1 The unit can be placed in the best location irrespective of direction of discharge.
- 2 The installer arranges the direction of discharge on the job in a matter of minutes. Saves time for him.
- 3 You only have to specify the model...and the dealer can supply it without doubling up his stock to be sure he has the proper discharge arrangement.

You can always count on **TRADE-WIND** for performance, quality and convenience.

The only ventilator that gives you

- Centrifugal Blowers
- Isolated Motor
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- Easier Installation
- Interchangeable Horizontal and Vertical Discharge
- Five-year Guarantee

PRICE OFFERS AN INDUCEMENT
BUT QUALITY OFFERS A REASON

TRADE-WIND
MOTORFANS, INC.

5709 So. Main St. Los Angeles 37, Calif.

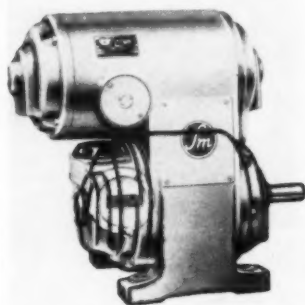


Instrument

(22)

Amprobe "600" has been added to this line of Amprobe snap-around volt-ammeters. It combines six ammeter ranges and 3 volt-meter ranges in one pocket-size instrument: 0-15/30/60/150/300/600 amps ac, and 0-150/300/600 volts ac. It measures current instantly without need of interrupting circuit or shutting down equipment. Some of the features are doughnut-type transformer; 9-range fingertip selection; voltage test lead plug is automatically insulated by snap-out sleeve when removed from meter; probe jaws completely insulated; high-visibility no-rim window.

Pyramid Instrument Corporation, Lynbrook, N. Y.



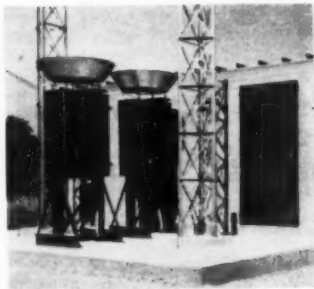
Variable Speed Drive

(23)

A variable speed drive with mounting dimensions that are interchangeable with NEMA standard motors has been announced. New drive consists of a variable speed transmission with positively adjusted pulleys and an induction motor built in a single, compact unit. It is designed to save machinery manufacturers the cost of building special bases where interchangeability between variable speed drives and NEMA standard motors is required. Available single phase in

sizes from 1 hp to 3 hp and polyphase in sizes from 1 hp to 15 hp, with 2-1, 3-1 or 4-1 speed variation, and in drip-proof, splash-proof and totally enclosed designs.

Sterling Electric Motors, Inc., 5401 Anaheim-Telegraph Road, Los Angeles 22, Calif.



Microwave Relay System

(24)

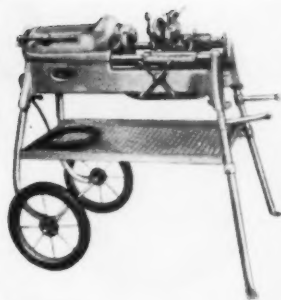
A new line of multiplexing equipment for Motorola industrial microwave radio relay systems which provides facilities for up to 24 voice channels. A cross-country communications system utilizing this equipment is capable of handling either 24 normal voice circuits, more than 400 teletype or telemetering operations, 1000 remote supervisory control functions or telegraph circuits, or any combination of these facilities. This equipment permits the users of previously supplied 10- or 12-channel systems to expand them up to 24 channels when desired. It features frequency modulation sub-carrier type multiplexing, incorporates the same principles as 10- and 12-channels systems and operates in the 6575-6875 megacycle frequency band. Equipment is available in two basic designs, remote type installation for use where customer already has housing facilities for radio equipment and power supplies, and "micropackage" for complete package installation.

Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Ill.

Threading Machine

(25)

Outstanding feature of the new RIDGID "500" pipe and bolt threading machine is a new type of self-contained die head. The new Quadri-type die head is instantly adjustable to thread 1 inch to 2 inch pipe, including over and under size, regardless of position of quick-opening lever and without removing dies or die head from machine. The new improved Dualtype die heads, one for 1/4 inch and 1/2 inch and one for 3/4 inch and



$\frac{1}{4}$ inch, offer the same instant size change right in the machine. Mono-type die heads, $\frac{1}{8}$ inch to 2 inch, and bolt die heads $\frac{1}{4}$ inch to 2 inch, which adjust to over and under size in machine, are also available. All tools in the "500" thread, cut and ream independently and close to the chuck, and swing up and out of the way when not in use. Thread oil system is concealed. Motor is universal forward-reverse, 115 volts, 25 to 60 cycles, ac or dc single phase, light socket power.

Ridge Tool Company, Elyria, Ohio.



Instrument

(26)

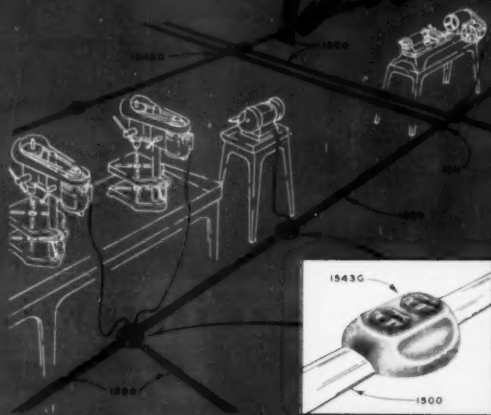
A new device, called the Short Finder, enables anyone to detect and locate shorted windings in generator and starter armatures. Device consists of an aluminum base casting, $19\frac{1}{4}$ inches by $5\frac{1}{2}$ inches by $1\frac{1}{2}$ inches, to which is mounted a special type transformer, vertically and horizontally adjustable bearing standards, and a vertically adjustable trouble indicator. Two heavy test prods with leads are mounted at the back of the base casting and are used for blowing out copper and solder shorts. Unit is equipped with a foot switch and a 10-ft. 14-2 line cord. Unit stands 8 inches high. It is adjustable to accommodate armatures from $2\frac{1}{2}$ inches to 4 inches in diameter. It is designed to operate from 115 volts, ac.

International Products Manufacturing Co., 1450 S. Michigan Ave., Chicago 5, Ill.

A two-part program
with a flexible wiring range

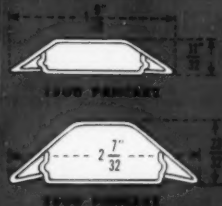
THE PANCAKE

Duet



In busy industrial plants and offices, PANCAKE Overhead Wiring Systems bring electrical connections right to the point of use. A safe, economical method of supplying adequate facilities for light and power... carrying current to small motors, work lights on machines... telephone and signal wiring... and other special low-voltage systems.

HERE'S THE DUET!



Look today for this new
bulletin describing in
detail the Pancake duet.

FLAT AS A PANCAKE...STRONG AS A BRIDGE



THE WIREMOLD COMPANY
HARTFORD 10, CONN., DEPT. A

Please send me a copy of the PANCAKE bulletin

Name _____
Company _____
Address _____
City _____ State _____

THE WIREMOLD COMPANY
HARTFORD 10, CONNECTICUT



THERE MUST BE AN EASIER WAY...

Intercommunication problems can reach serious proportions when allowed to get out of hand. And let's face it—regular switchboards can't handle outside and interoffice calls at the same time.

But when a Couch Private Phone System handles inside calls, operators and switchboards can serve their proper function—valuable outside lines are freed—expensive regular phones used *only* for intercom, can be removed.

You can eliminate your intercom problems with a Couch Phone System—from two to fifty stations, there's a system right for your needs.

Let Couch clear your lines to speed up orders, free personnel for necessary work.

Write us your requirements—we'll recommend the system best for your needs.

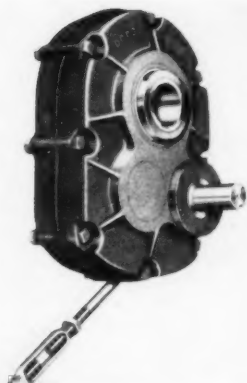


COUCH AUTOPHONE SYSTEM

... with simplified dialing 30 or 50 line systems ... "one shot" dialing saves time, eliminates manually operated switchboard ... simple, rugged, inexpensive.



Private telephones for home and office ... hospital signaling systems ... apartment house telephones and mail boxes ... fire alarm systems for industrial plants and public buildings.

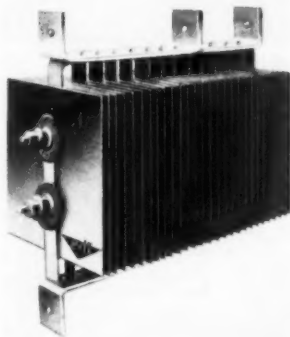


Speed Reducer

(27)

A new double reduction shaft-mounted speed reducer with capacity to 43 hp, and for output speeds from 12 to 110 rpm. The No. 7 is shaft-mounted and anchored with a torque-arm which fastens to any fixed object. A turnbuckle enables easy adjustment of belt tension. There is no foundation to provide; no flexible couplings are needed. The Torque-Arm line totals eleven and is divided in two series, single and double reduction, with capacities from 1 hp to 43 hp, output speeds from 12 to 330 rpm. The new Tri-Matic Overload release is applicable to the new No. 7 model.

Dodge Manufacturing Corporation, Mishawaka, Ind.



Power Rectifiers

(28)

A group of selenium type Powersel rectifiers for military and commercial applications has been announced. They are rated at a higher wattage per unit of volume than is usual for their type. This rating is made possible by a unique manufacturing process which produces rectifier plates

of high reverse resistance and low forward resistance. The aluminum base plates on which they are manufactured and the aluminum hardware with which they are used, make for minimum weight and size of rectifiers. They can be supplied in a variety of electrical configurations and ratings, which can be coated with special protective finishes or hermetically sealed to meet extreme operating conditions.

Electronic Devices, Inc., 429 12th Street, Brooklyn 15, N. Y.



Pull Adaptor (29)

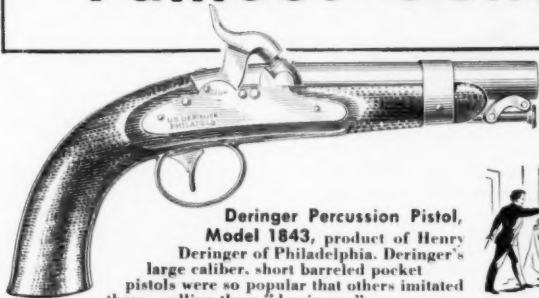
It is now possible to utilize the universal-lever action of Levolver switches mounted vertically by installing this new vertical pull adaptor No. 84. The adaptor converts the straight down pull of switches mounted vertically to the usual file action horizontal pull of this universal lever switch. It is designed especially for straight down mounting of Levolver switches and can be concealed behind the louvers or fluorescent tubes. The adaptor consists of a short extension arm which snaps over the switch lever and a slotted guide arm to maintain proper alignment.

McGill Manufacturing Co., Inc., Valparaiso, Ind.

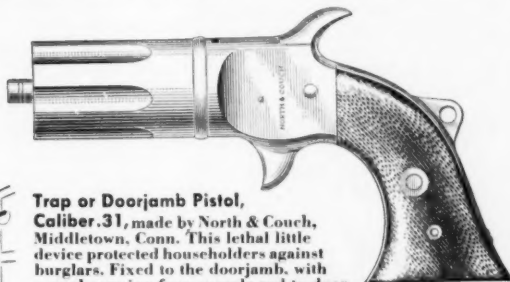
Lighting Fixture (30)

The patternizer is a new luminaire. The Rib-O-Glass units when surface mounted for individual or continuous rows, have a troffer-like appearance, hugging the ceiling, while providing a smooth spread of light on the ceiling surface. Solid metal fixtures provide maximum direct light, and will permit a variety of designs with use of adjustable Spot-lite, No. PA 150. Hinged louvers achieve standard 35° shielding, also available in 45°. All reflecting surfaces are baked white enamel con-

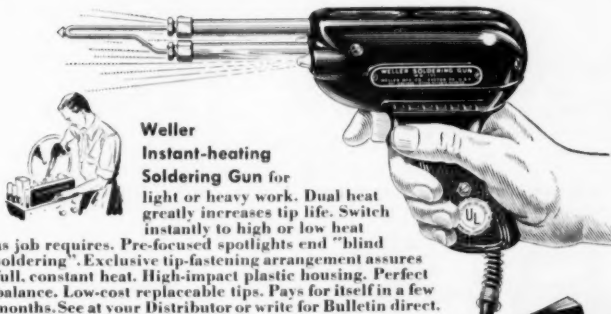
Famous Guns



Deringer Percussion Pistol, Model 1843, product of Henry Deringer of Philadelphia. Deringer's large caliber, short barreled pocket pistols were so popular that others imitated them—calling them "derringers". John Wilkes Booth used a Deringer to assassinate Lincoln.



Trap or Doorjamb Pistol, Caliber .31, made by North & Couch, Middletown, Conn. This lethal little device protected householders against burglars. Fixed to the doorjamb, with a cord running from muzzle rod to door, the pistol fired all its barrels into any intruder.



Weller Instant-heating Soldering Gun for light or heavy work. Dual heat greatly increases tip life. Switch instantly to high or low heat as job requires. Pre-focused spotlights end "blind soldering". Exclusive tip-fastening arrangement assures full, constant heat. High-impact plastic housing. Perfect balance. Low-cost replaceable tips. Pays for itself in a few months. See at your Distributor or write for Bulletin direct.

Get SOLDERING TIPS, new Weller Handy Guide to faster, easier soldering. 20 pages fully illustrated. Price 10¢ at your Distributor or order direct.

Weller BETTER FROM GRIP TO TIP!

SOLDERING GUNS 815 Packer Street, Easton, Pa.
The Finest Soldering Tool for the Finest Craftsmen

MARTINDALE GROWLERS

PORTABLE
GROWLER
TYPE U-2



This Universal Adjustable Growler may be used as both an external Growler for armatures and an internal Growler for stators. It will test armatures from 2" diameter up, and stators from 5 3/4" diameter up.



ADJUSTABLE
BENCH
GROWLER

Has adjustable jaws with face length of 2 1/2". With jaws closed will test armatures as small as 1" diameter. With jaws open, will accommodate armatures as large as 18" diameter.

Both types available with or without meters. Also six other models.

MARTINDALE WHEEL AND GEAR PULLER



Adjustable arms pull straight without squeezing the work. Set screws prevent spreading.

Made in 2 Styles and 4 Sizes up to 24" diameter.

MARTINDALE COMMSTONES AND COMMUTATOR GRINDING TOOLS



MICA UNDERCUTTERS FOR
SLOTING COMMUTATORS



Nine Motor Driven Types

Write for 64-page Catalog describing these and many other products for Industrial Maintenance, Safety and Production.

MARTINDALE ELECTRIC CO.
1309 Hird Ave. Cleveland 7, Ohio

struction, heavy gauge steel. Knock-outs provided for either surface, pendant, individual or continuous. Units are available in standard, fluorescent, instant-start fluorescent, 48-in. and 96-in. slimline. Recommended for stores, showroom, offices, schools, libraries, hospitals, institutions.

*Apollo Lighting Fixture Co., Inc.,
214-218 South Fourth Ave., Mount
Vernon, N. Y.*



Instrument

(31)

This new Type AC-1 volt-ammeter is a clamp-type, hand-sized measuring instrument that does two separate jobs—measures volts and amperes. Readings are made without breaking circuit or insulation. To read amperes the convenient tripper is pressed, opening the pair of insulated jaws so that they can be encircled around the power cable or bus bar. The jaws will accommodate cables up to 1 1/2 inches in diameter and bus bars up to 2 inches by 1/2 inch. Four ampere ranges are available: 0-12, 0-60, 0-120, 0-600 ac amperes. Voltage leads are plugged into the handle of the instrument. Two voltage ranges are available, 0-150 and 0-600 ac volts. Instrument is held and operated with one hand. Overall dimensions are 11 inches by 3 1/2 inches by 1 1/2 inches. Accuracy is plus or minus 3% of full scale deflection.

*Columbia Electric Mfg. Co., 4553
Hamilton Ave., Cleveland 11, Ohio.*

Radiant Heat Unit

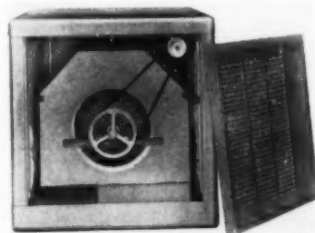
(32)

A single electrical ceiling unit which provides radiant heat plus overhead light has been announced. The Electriglas Thermolite installed in place of an ordinary lighting fixture, saves space and eliminates the cost of additional heating equipment. Outer portion of circular ceiling appliance, con-



sists of a panel of unbreakable, shatter-proof glass containing a heating element fused into it. When electricity passes through the element the glass becomes the source of radiant heat. Diffused light streams through the white opal glass center lens. Light and heat operate independently or together. Thermolite, which measures 20 inches in diameter, can be installed with thermostat for fully automatic operation or with two wall switches, one for light and one for heat; or a three-way pull switch. Unit can be installed in present homes as well as in new construction.

*Appleman Glass Works, Bergen-
field, N. J.*



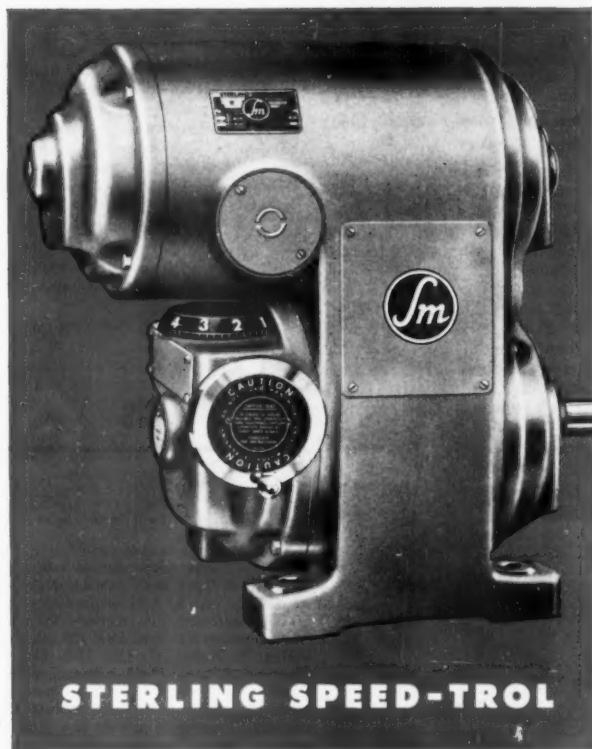
Air Coolers

(33)

Five new "Down Discharge" evaporative air coolers have been added to this line. They range from 3700 CFM to 6600 CFM capacity and are constructed in such a manner that the cool air discharges through the bottom of the coolers, permitting installation on roofs. They may be installed without exterior ductwork. Features of units include "No-Clog Sta-Fresh" filters, "Grip-Lock" filter holders, "Free-Flow" externally adjusting water troughs, "Uni-Weld" construction. They are for commercial, industrial and residential use.

*Essick Manufacturing Company,
1950 Santa Fe Ave., Los Angeles 21,
Calif.*

GOLD STAMPING OUTPUT INCREASED 25% WITH



STERLING SPEED-TROL!

Replacement of slip-ring motors on our gold stamping machine with Speed-Trols, reports Mr. Charles F. Gallagher, Superintendent at Fort Orange Press, Albany, N. Y., gave us the following advantages: Maintenance costs reduced 50%... power costs reduced 15%... production increased 25%... quality improved 30%... defective stamping reduced 5%... machine versatility improved... employee morale improved... installation was made quickly and economically because of interchangeable mounting dimensions between Speed-Trols and our old slip-ring motors.

STERLING SPEED-TROL GIVES YOU VARIABLE SPEED CONTROL NECESSARY FOR:

EQUIPMENT ADAPTATION TO: Sequence synchronization—operators' abilities—load variations due to differences in quantity, quality, weight, size, tension, hardness or shape of material to be processed, machined, conveyed, blended, mixed, etc.

PROCESS CONTROL OF: Temperature—viscosity—level—pressure—flow—etc.

TIME CONTROL OF: Baking—drying—heating—cooking—pasteurizing—soaking—chemical action—etc.

With Speed-Trol you get the maximum in production, plant efficiency, quality and profit

OTHER STERLING ELECTRIC POWER DRIVES:

- STERLING SLO-SPEED (GEARED) MOTORS
 - STERLING KLOSD AND KLOSD-TITE (NORMAL SPEED) MOTORS
- DRIP-PROOF • SPLASH-PROOF • TOTALLY ENCLOSED



70 ILLUSTRATIONS showing how Sterling Electric Power Drives reduce production costs. Write for Bulletin No. A-126

STERLING ELECTRIC MOTORS

Plants: New York City 51; Van Wert, Ohio; Los Angeles 22; Hamilton, Canada; Santiago, Chile.
Offices and distributors in all principal cities.



POWER DRIVEN ROLLERS

- ★ Protect Cutter Wheel
- ★ Speed Cutting

E-Z cutter rollers revolve the pipe. Cutter wheel has much longer life because it is always cutting...never slipping. Does not wear in one spot. Approximately 2,000 cuts to each sharpening.

E-Z cutter range is from 3/8" to 4". No time lost for pipe or conduit size change. One machine handles all your work.

EASILY PORTABLE FOR ANY JOB, ANYWHERE!

SEND FOR FREE CATALOG!

QUIJADA TOOL CO., INC.
3474 Alhambra Avenue
Los Angeles 32, California

Gentlemen: Please send me your new catalog, number ECS

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



Transformer

(34)

Four new sizes have been added to this line of pole start distribution transformers—167 kva, 250 kva, 333 kva, and 500 kva. They are available in all standard voltages through 44 kv. Pole start transformers are now available in all standard ratings from 3 kva to 500 kva—the full range of single phase distribution transformers. The new 167 to 500's are built around Pennsylvania's patented wound core, which is wound of oriented electrical steel. Exciting currents in the new transformers are 75% less than in Pennsylvania's former stacked core distribution transformers. Weights are down as much as 30%.

Pennsylvania Transformer Co., Box 330, Canonsburg, Pa.

stallation. Feature is a spring that responds to hand tension. With it, the night-light snaps quickly into the base hole. It is adaptable to a one-inch hole, and fits firmly against all base plate thicknesses from 1/2 to 3/4 of an inch.

Miller Electric Company, 32 River St., Pawtucket, R. I.

Deep Wing Panel

(36)

New deep wing panels for self-supporting instrument and control panelboards. Unit is made of steel, usually 1/4-in. to 1/2 in. in thickness, with return edges at top and bottom of 2-in. and side wings from 12-in. to 18-in. or wider for special purposes. These wings serve as support members and can also be used to mount terminal blocks and other electrical or mechanical equipment. If necessary, doors and top can be added to panel with very little field work. This design has permitted control panels to be placed where they will be away from wall and where they can be most advantageously located.

Falstrom Company, Falstrom Court, Passaic, N. J.

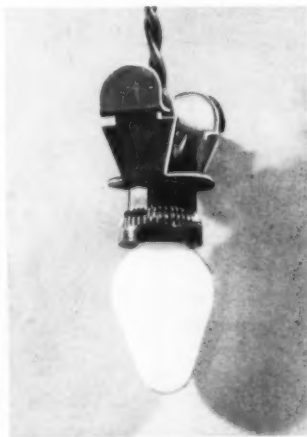
Product Briefs

(37) Yardney Electric Corp., 105-17 Chambers St., New York 7, N. Y. has introduced two new Silvercel storage batteries.

(38) Thunder-Core carbide tipped masonry drill bit is designed for drilling holes 1/2 inch to 5 inches in diameter in hard masonry. It is made by the New England Carbide Tool Co., Cambridge 39, Mass. . . . (39) Hild Floor Machine Co., 740 W. Washington Blvd., Chicago 6, Ill., has developed a new 55 gallon heavy duty portable vacuum. It holds 5 bushels of dry dirt or 40 gallons of recovered liquid. . . . (40) A. L. Okun Company, 148-26 58th Ave., Flushing 55, N. Y., has announced a new cold solder, which is a fast drying cold metal in putty form and dries to metal hardness.

(41) A new, self-contained, uniplex dust collector for use in industrial dust control requiring 5,500 cubic feet of air per minute has been added to its line by Agat-Detroit Company, Ann Arbor, Mich. . . . (42) The L. H. Leeds Corp., 721 St. Mary's St., New York 54, N. Y., has provided a series of full-color decorated switch plates. . . . (43) The Superior Electric Co., Bristol, Conn., has announced the addition of Powerstat type 10 to its line. It is designed for 50, 100 and 150 watt applications.

(44) A new standard-voltage, lightweight, soldering iron, designed for



Night-Lights

(35)

Faster installation of night-lights in hurricane lamp bases is now assured with a new snap-in, snap-out night-light unit. This development substitutes an instantaneous finger-grip in-

pinpoint, high-speed soldering in close quarters, has been announced by General Electric Co., Schenectady 5, N. Y. . . . (45) Improvement of two Chromalox industrial electric heaters used in the chemical, paint, metal working, and finishing industries has been announced by Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa. . . . (46) New "Donut" instrument current transformer for use with inserted primaries, have been developed by Associated Research, Inc., 3752 W. Belmont Ave., Chicago 18, Ill.

(47) A direct reading, indicating pyrometer controller incorporating a built-in unit to provide straight-line control is being offered by Wheelco Instruments Co., 847 W. Harrison St., Chicago 7, Ill. . . . (48) Eagle Electric Mfg. Co., Inc., 23-10 Bridge Plaza South, Long Island City 1, N. Y., has developed new oil burner emergency switches, consisting of a single pole toggle switch mounted on 3-inch and 4-inch steel plates. . . . (49) A new portable stud welder has been added to its line by the Graham Manufacturing Corp., 1643 National Bank Bldg., Detroit 26, Mich.

(50) The M. & W. Electric Mfg. Co., East Palestine, Ohio, has introduced a new cable rack. . . . (51) New Hi-Lift telescopic towers for heights above 30 feet have been announced by the Atlas Industrial Corp., 849-39th Street, Brooklyn, N. Y. . . . (52) A new threaded steel rod is now available for industrial repair, installation, and construction work. It is made by Redi-Bolt, P. O. Box 6102, Chicago, Ill.

(53) Two completely redesigned portable mercury-vapor detectors, Type A (Electronic) and Type B (Chemical), for indicating concentrations of mercury which would be harmful to industrial workers, have been announced by the General Electric Co., Schenectady 5, N. Y. . . . (54) An electronic strip chart recording and indicating program controller has been introduced by the Minneapolis-Honeywell Regulator Co., Brown Instruments Div., Wayne & Windrim Aves., Philadelphia 44, Pa. . . . (55) Elliot Manufacturing Co., Binghamton, N. Y., has new line of Econoflex flexible shaft unit drives, available in four size ranges—heavy duty, medium duty, light duty and drill shaft unit.

(56) Swivelier Company, Inc., 30 Irving Place, New York 3, N. Y., has introduced new Vogue-lites, for direct and indirect lighting. . . . (57) Heli-Coil Corporation, 1184 Shelter Rock Lane, Danbury, Conn., has developed stainless-steel helical-wire thread inserts. . . . (58) Equipto, Division of Aurora-Equipment Co., Aurora, Ill., has announced a new 18-inch deep 18 drawer steel cabinet. . . . (59) Two new Speedmatic electric saws, have been announced by Porter-Cable Machine Co., Syracuse, N. Y. . . .



Dependable Performers

For long, smooth service "Latrobe" Floor Boxes and Wiring Specialties are tops. Years of performance have proved that. And, "Latrobe" Boxes are designed in a way that permits fast, easy installation—cutting labor costs to the bone.



Sold Only Through Wholesalers

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

Why Pipe Fitters Insist On

RIGID

LonGrip Pipe Reamers



Quick easy pipe reaming— Won't flare or split pipe

- ★ Extra-long-taper on **RIGID** LonGrip smooths burr off cleanly from pipe or conduit ends.
- ★ Reams easily with a few light ratcheted strokes—and fast.
- ★ No risk of thinning, flaring or splitting pipe or conduit.
- ★ Comes complete with ratchet handle; No. 2 reamer unit sold separately, fits **RIGID** 00R die stock handle.
- ★ Saves time and work—buy it at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO



CATALOGS and BULLETINS

(60) **MOTORS AND CONTROLS** for the chemical industry are illustrated and described in 33-page booklet, including construction details and data on the application of the units to such problems as corrosion, hazardous locations, outdoor service, minimum space and weight, and centralized control. Westinghouse Electric Corp.

(61) **SELENIUM RECTIFIERS** for dc plating power are illustrated and described with drawings and data on equipment for various requirements in booklet "A Guide To Better Plating Power", including the complete line of rectifier units. Bart-Messing Corp.

(62) **INDUSTRIAL MOTORS**, integral horsepower, polyphase ratings, in all commercial frequencies, and with NEMA standard frames, are illustrated and described in 4-page bulletin, covering the construction, operation and application of the line of drip-proof motors from 1 to 60 hp. Electro-Dynamic, Div. of Electric Boat Company.

(63) **LIGHTING BULLETINS** Nos. 6 and 7, the latest in the series of "See Better—Work Better" booklets on industrial lighting, offer a total of 16 pages of technical data and application information on special lamps and maintenance and simplified lamp replacement. General Electric Company.

(64) **SELENIUM RECTIFIER STACKS** are discussed with charts, graphs and tables in 28-page, two-color booklet describing the principles of rectification, and the characteristics, manufacture, circuit design and application of selenium rectifiers. General Electric Company.

(65) **LIGHTING FIXTURES**, incandescent "Vogue-Lites" for direct and indirect lighting, are described, illustrated and priced in bulletin 131, including technical data on the sockets and swivel mounts, dimensions, available colors of the modern units and information on ordering. Swivelier Company, Inc.

(66) **INFRA-RED SHRINKERS** for shrink fit assembly operations on gears, metal parts, ball bearings, wrist-pins, pistons, rocker-arms, electric motor frames, etc., is described and illustrated in bulletin, including complete specifica-

tions, operating data and typical applications. The Miskella Infra-Red Company.

(67) **POWER DRIVES** catalog contains 20-pages of illustrated descriptive information on variable speed drives, geared motors and constant normal speed motors in drip-proof, splash-proof, totally enclosed and pipe ventilated designs. Sterling Electric Motors, Inc.

(68) **RADIANT HEATERS**, industrial units with radiation in the far-infrared region, are illustrated and described in 6-page folder, including specifications, control data and examples of typical industrial drying applications. Edwin L. Wiegand Co.

(69) **DC POWER SUPPLY**, a source of variable stabilized-regulated dc voltages operating from ac power lines, is the subject of illustrated bulletin VI051, including circuit diagrams, application data and specifications on the unit. The Superior Electric Co.

(70) **SOLDERLESS TERMINAL** catalog describes and illustrates in color over 35 different types of terminals, connectors, crimping tools, merchandisers and counter kit displays, including a terminal cross reference chart and information on application. Vaco Products Co.

(71) **WIRE MARKERS**, pipe markers, safety signs, reflective signs, masks and stencils, and printed roll tape are described, illustrated, specified and priced in 50-page catalog of industrial self-sticking products, including information on the use of number, letter and symbol labels for production, identification, inspection, labeling and sealing. W. H. Brady Co.

(72) **INDUSTRIAL PROCESS HEATING** with ovens and furnaces is the subject of 16-page booklet, including tabulated technical data on methods of materials handling, typical temperature cycles, new methods of heat application and the selection of industrial heating equipment. Jensen Specialties, Inc.

(73) **SNAP-ACTION SWITCH** is illustrated, described and priced on data sheet 63, covering the characteristics, ratings and operation of the switch contacts in closing the normally-open circuit before the normally-closed circuit is opened. Micro Switch.

(74) **ARC-WELDING** accessories are described in two-color, 4-page illustrated bulletin GEC-864, including the use, operation and specifications on more than a dozen holders, ground clamps

Look! It's Really Portable—

RIGID

"400" POWER DRIVE

On Wheels!



Wheel legs and front handles available to convert your present "400" to wheel model; or legs and tray to make bench model into stand.

**Power for hand threaders, cutters, reamers
now easily rolled where you need it!**

- ★ One man can easily wheel-barrow this popular **RIGID** power unit close to the work—think of the time and muscle saving!
- ★ And it stands still and delivers plenty of power—universal motor, forward, reverse, $\frac{1}{4}$ " to 2" conduit or pipe.
- ★ **RIGID** design 3-jaw chuck, 6 adjusting pinions, one always handy; self-centering workholder in rear.
- ★ Sealed-in lubrication—no oil to spill.
- ★ See it, compare it—buy the unequalled "400" at your Supply House!

THE RIDGE TOOL COMPANY • ELYRIA, OHIO



**Make
Naked 8 Bar
Conductors
SAFE**



with

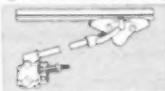
insul 8 bar™

the new insulated trolley system

- Low cost
- Quick, easy installation
- For either existing or new systems

This revolutionary safety system is easily and inexpensively applied to either existing systems (without dismantling) or as a complete new system. Naked figure-8-bars in your plant can be fully insulated quickly—for maximum safety.

The sliding shoe collector is held against the



insulated 8 bar by spring action, adjustable from 2 to 10 pounds.

NOTE: the Insul-8-Bar system (pat. pend.) is adapted to short radius curves, all types of switches and crossovers.

- Distributors coast-to-coast
- Write for detailed description of the Insul-8-Bar system, and name of your nearest distributor.

BENBOW MANUFACTURING COMPANY
1205 ROLLINS ROAD • BURLINGAME, CALIF.

BENBOW
INSULATED TROLLEY
busways

and connectors, General Electric Company.

(75) **SHADED POLE MOTORS**, unidirectional, reversible and synchronous, are illustrated and described in two-color, 4-page illustrated bulletin F-3168-1, with data on each of these small motors and exploded views of the construction of the motors, Barber-Colman Company.

(76) **CAPACITOR-START MOTORS**, in ratings from $\frac{1}{8}$ through 3 hp, for general purpose applications requiring high starting torque, are illustrated and described in bulletin MU-185, covering open or totally enclosed types, sleeve or ball bearing, with rigid or resilient bases or a machined end plate for flange mounting, Wagner Electric Corp.

(77) **LIGHTING FIXTURE** catalog contains 8 pages of illustrated technical data on 31 distinct types of exit and directional lighting units for theatres, hospitals, public buildings, institutions, etc., including many types of illuminated signs, Gruber Bros., Inc.

(78) **ELECTRIC HEATERS** for home and farm use are described and colorfully illustrated in portfolio of bulletins, covering prices and specifications on electric heating cable, electric water heaters, electric room heater, electric pail heater, single and double burner electric table stoves, space heaters and water heaters with built-in thermostats, Edwin L. Wiegand Co.

(79) **SELECTOR CHART** for ground fittings lists ground clamps and conduit hubs for 30 common combinations of different ground wire and water pipe sizes, including general purpose ground clamps for armored and unarmored wire, The Thomas & Betts Co.

(80) **PIPE THREADER**, 26 pounds, portable unit for threading from $\frac{1}{4}$ inch to 4 inch pipe, is the subject of large folder listing construction details, adaptors for using the most common die stocks, applications and operation data and complete specifications on this ac or dc motor powered threader, Thread-Ezy Mfg. Co.

(81) **SOLDERING IRON**, lightweight, is described and illustrated in bulletin GED-1583, including information on application to radio, television, electronic and instrument work for high speed, pinpoint soldering in close quarters, General Electric Company.

(82) **ALUMINUM CONNECTORS** catalog contains 32-pages of detailed technical data on compression joints for copper and aluminum cable and information

on the use of hydraulic installing tools, including illustrations and ordering information, The Thomas & Betts Co.

(83) **FANS AND BLOWERS** catalog describes 30 fan types and over 300 sizes, including prices, complete specifications, dimensions, installation diagrams and product photographs and extensive data on the selection of fans for every industrial, residential and commercial requirement, Chelsea Fan & Blower Co.

(84) **GEARMOTORS**, 61 standard fractional horsepower models, are described in two-color, 8-page booklet GEA-5678, covering the applications for FHP gearmotors, the selection of the proper size, specifications on the units and maintenance hints, General Electric Company.

(85) **PORTABLE HEATER**, Model PJ-13, is the subject of two-color, illustrated folder, including complete description of the heater with specifications and application information, Electromode Corp.

(86) **FAN SELECTION** data is the subject of bulletin 450 which illustrates and describes with graphs, tables, diagrams and typical examples, the selection and application of fans for general ventilation, removal of fumes, dust, heat and steam and for cooling and drying circulation, Chelsea Fan & Blower Co., Inc.

(87) **FLUORESCENT LUMINAIRES**, luminous indirect type for two 40-watt, and 40-watt and 60-watt slimline lamps, are illustrated and described in 4-page bulletin, including technical data on the construction, operation and installation, Day-Brite Lighting, Inc.

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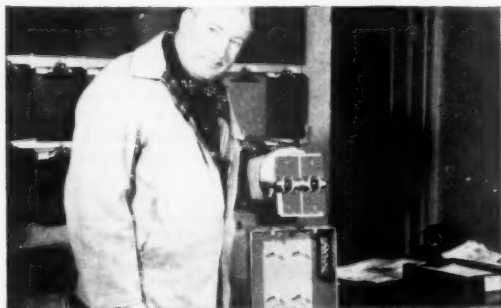
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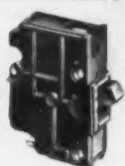
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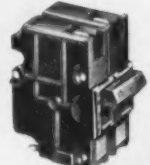
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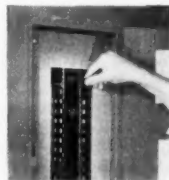
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Reader's Quiz

Circulating Current

QUESTION K20—A transformer bank composed of three 333 kva transformers is hooked delta-delta. The primary side is fed by a three phase, 2400 volt line; the secondary is 480 volts and has a balanced three phase load. The impedance is 3.05 on all transformers. There is a circulating current at no-load of 42 amperes. Does this mean that there is a circulating current at all loads from no-load to full load? Is there any way of stopping this circulating current?—M.D.

ANSWER TO K20—The circulating current observed by M.D. is the result of saturation and hysteresis within the transformer coil which prevent the flux from building up in direct proportion to the primary voltage. In wye-wye connected transformers these two factors result in distorted secondary voltages, one of the reasons this type connection is seldom used. However, in a transformer bank with a delta connection on one side, as in M.D.'s delta-delta, there is a third harmonic circulating current which provides the necessary compensation for saturation and hysteresis, and eliminates distortion of the secondary voltage. This current circulates through the closed path formed by the transformer windings at 180 cycles per second at all times, but it does not change with load.

While 42 amps may seem high for a current that serves no apparent purpose, M.D. should remember that full load secondary current on a 1000 KVA bank is 700 amps, and the third harmonic is only 6%. As long as transformer impedances are matched there is nothing further he can do to eliminate it, and its presence is perfectly natural.—D.H.N.

ANSWER TO K20—A transformer with an iron core has a varying ratio of voltage to current throughout a cycle. Core saturation at the peaks of the exciting current wave reduces the inductance of the circuit, thereby permitting proportionately greater current to flow. This gives rise to harmonics—waves of higher than nominal circuit frequency—in the primary current. Normally the third harmonic is the largest, with the others

diminishing in importance with higher frequency. Such harmonics in the primary current induce like harmonics in the secondary voltage, but not always in direct magnitude proportions.

When transformer secondaries are connected in delta, induced third harmonic voltages (and their multiples) do not appear in the secondary lines. The fundamental voltages are 120° out of phase. The third harmonics are 3 × 120° or 360° out of phase with each other, the sixth are 6 × 120° or 720° out of phase, and so on. Actually, 360° and 720° represent a zero phase relationship. Consequently, such triple harmonics are in phase with each other and add together around the delta. This can be demonstrated by opening one corner of the delta and taking a voltage reading across the opening.

Such a voltage causes a current to flow around through the delta, limited by the impedance of the three transformers in series. (The impedance will be different for each frequency in the composite wave.) Suppression of the circulating current can be accomplished to some extent by physical design of transformers, but some circulating current may always be expected in a delta. From a practical standpoint, the value of the circulating current may be regarded as being the same at all loads. If the no load value does not exceed 10% of the full load rating of the smallest transformer in the bank, there need be no concern.

Two other causes of circulating currents can be mentioned. In one, the ratios of transformation of all units may not be equal. Small design or manufacturing differences may exist, or similar transformers may not all be operating with the same tap connections. In the other, the different transformers in the bank may not all have appreciably the same ratio of resistance to reactance. In either event, when vectors are plotted out, it will be found that the delta does not "close." A circulating current of fundamental frequency will exist in addition to that from the triole harmonics.

It is possible that none of the foregoing conditions may be suspected by an attendant. Therefore, temperature readings should be stressed in equal importance to line current values.—L.E.B.

Electric Motor Governors

QUESTION L20—Why could not a governor be used on an electric motor for speed regulation?—E.S.H.

ANSWER TO L20—Thomas Edison conceived the idea of governor controls for motors as early as 1882. It is evidently not a new trend of thought but it is one that has possibilities for further development. This type of speed control is used quite extensively with small universal motors. Control is obtained by using the centrifugal force to open a pair of contacts across which is connected a suitable resistor. This resistor is connected in series with the motor winding by means of slip rings and brushes and is cut in and out of the circuit by the opening and closing of the contact points. A condenser is usually shunted across the points to prevent pitting and burning.—H.C.S.

ANSWER TO L20—A governor is a device used for controlling the speed of a prime mover, such as a steam engine or a water wheel. Centrifugal force slings the flyballs outward, causing the height of the pendulum to shorten which, when transmitted to the throttle or gearing, regulates the speed automatically within allowable tolerances. This mechanism does not lend itself readily to speed control of motors. In order to change the speed of an induction motor, for instance, it is necessary to change either the frequency, slip, or number of poles. In a direct current motor, it is necessary to vary either the back e.m.f. or the flux. Not one of these changes can be performed through the use of a governor without the additional use of auxiliaries more elaborate and costly than the present known methods of speed control.—W.R.S.

ANSWER TO L20—Governors are sometimes used on Universal motors. You will find a very good explanation of such a motor in the book *Fractional Horsepower Motors* by Cyril Veinott published by McGraw-Hill Book Co., New York.—B.C.M.

ANSWER TO L20—Various types of centrifugal governors are used for speed regulation of small motors such

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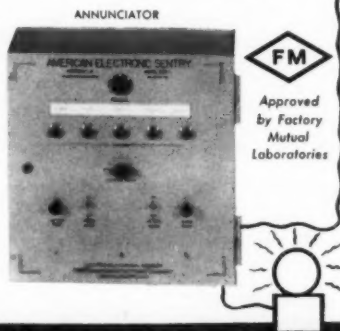
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as those used on record players, etc. In these applications the governor actuates a mechanical brake.

Close speed regulation of larger dc motors has been accomplished by using a sensitive centrifugal governor in conjunction with low friction contact mechanism for varying the shunt field current of the motor. Very slight changes in motor speed will cause the field current to be changed sufficiently to adjust the motor speed to the predetermined value.—R.W.H.

Circuit Breaker

QUESTION M20—In a discussion one day the term circuit breaker was brought up, and its meaning was debated. My question is: would you classify any disconnecting device with a thermal overload protecting feature, as a circuit breaker?—W.R.B.

ANSWER TO M20—Inasmuch as thermal overload protection is not an essential function of a circuit breaker, but is included in a variety of control devices, such a piece of apparatus need not necessarily be called a circuit breaker.

Article 100 of the National Electrical Code (1951) defines a circuit breaker thus: "A device designed to open under abnormal conditions a current-carrying circuit without injury to itself." The term, as used in the Code, "applies only to the automatic type designed to trip on a predetermined overload of current." Circuit breakers, however, are not always of the automatic type, and many are manually operated. The two common types in general use are designated as (1) Air, and (2) Oil circuit breakers, depending on whether the contacts are separated in air or within an enclosure under oil.

Circuit breakers are obtainable with many features, such as instantaneous or time-delay overcurrent and/or undercurrent trips. The essential feature that distinguishes a circuit breaker from other disconnecting or current-interrupting devices, is its ability to break the highest value of fault current that can occur in the circuit to which it is connected, the actual method used to cause the device to operate being a secondary consideration. In other words, the function of the circuit breaker is to positively isolate a circuit from the power source when desired or when some predetermined condition develops.—L.N.W.

ANSWER TO M20—The answer can best be given by replying to the second part of the question first. The AIEE

definition, accepted by the American Standards Association, is "A circuit breaker is a device for interrupting a circuit between separable contacts under normal or abnormal conditions."

Knowlton's Standard Handbook for Electrical Engineers (McGraw-Hill, 1949) defines a circuit breaker as follows: "Circuit breakers are mechanical devices designed to close or open contact members, thus closing or opening an electrical circuit under normal or abnormal conditions."

The National Electrical Code gives a definition as follows: "A device designed to open under abnormal conditions a current-carrying circuit without injury to itself. The term as used in this code applies only to the automatic type designed to trip on a pre-determined overload of current."

According to the first two definitions given above, your "disconnecting device with a thermal overload protecting feature" would be classified as a circuit breaker, assuming that the device was either mechanically operated or had separable contacts.

As used in the trade, both definitions should be abridged to specify that the protective device need not be renewed after an automatic interruption. This abridgment is made in the Code definition quoted above and would not include a fused disconnecting device as a circuit breaker.

The classification would therefore depend on the standard adopted for comparison.—M.S.

Changing Voltage

QUESTION N20—We have a 50 hp, 3 phase, 2300 volt, 900 rpm induction motor that we should like to use on 440 volts at the same speed. Would it be practical to do so and what changes would be required?—W.P.R.

ANSWER TO N20—The winding of your 2300 volt motor is connected series star or, possibly series delta. Assuming it is a 60 cycle motor, there are eight, series connected pole groups in each phase. Therefore, when reconnecting this motor for a lower voltage, the number of pole groups connected parallel must be a multiple of eight.

If the motor is connected series delta, it would be practical to reconnect it to eight parallel star. The new voltage of the winding would then be 2300 times 0.125 times 1.73 or 497 volts, which would be satisfactory for normal operation on a 440 volt line.

I have found that in most cases the actual line voltage is higher than the rated voltage. If your motor will be subject to a heavy starting load or

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TRANSFORMERS**

continuous overload, I would suggest that you first measure your line voltage and determine if it could be increased to about 460 volts by changing the transformer taps.—M.J.H.

ANSWER TO N20—It should be possible to make the desired voltage change. The important point is to keep the volts per turn of coil about the same as in the present motor. In some cases this is possible without rewinding depending upon the motor. This is done by changing from series to parallel connections and delta to wye phase connections and vice versa.

However, with the motor having eight poles (900 RPM) and when changing from 2300 to 440 it is not likely that the winding can be reconnected and still be within the desirable limit of 90 to 110% of the original volts per turn. This being the case rewinding would be necessary and this, although more work, should be practical.—P.S.

ANSWER TO N20—A 2300 volt motor cannot be operated on 440 volts. It will be necessary to either reconnect the coils of the stator or if that is not possible the stator will have to be rewound. No change is necessary in the rotor.

Suggest you contact the manufacturer of the machine giving him all information on the name plate including Ctg, number, type and serial number. They will tell you if it can be reconnected or if it will be necessary to rewind it. They will also give you a price or recommend some local shop where the work can be done properly. A.E.T.

Voltage Readings on Ungrounded Systems

QUESTION P20—Why do you get a voltage reading from any one phase to ground on an ungrounded 3 phase system?

And using 550 volts—3 phase ungrounded system as an example—Why do you get various voltages readings to ground in different buildings? (For example—In one factory you will get a reading from any one phase to ground of 360 volts. In some other factory you may get a voltage reading of 330 volts from any one of the 3 phases to ground, etc. Why the difference?)—A.R.

ANSWER TO P20—The voltage to ground, on systems which have no grounded conductor, is due to leakage and capacitor effect. The conductors act as one plate of a condenser and

the earth acts as another, and this allows a "charging" current.

The amount of voltage to ground depends upon the length of the conductors, the type of raceways, the amount of moisture in the air (as well as on the equipment), also the efficiency of insulation on conductor and in the equipment.

Most of the distribution and transmission systems have none of the conductors grounded, yet all of the wires will have plenty of potential to ground, caused by the same above leakage on the systems.—M.C.T.

ANSWER TO P20—The reason you get a voltage reading from the ground to 3 phases (A-B-C) of the ungrounded system is, because somewhere along the line, either the primary or secondary of the transformer with the circuits within the building, there is a leak in the insulation sufficiently to permit the voltage readings indicated.

The different buildings having different readings shows where the leak is. Where the greatest reading is shown the leak is within that building.

However, if you undertake the job of locating this trouble, you must check each circuit with a Megger. If any circuit shows infinity that circuit is good. If on the other hand the Megger reads shorted (continuity) then that circuit should be cleared.

When one building after another is completed and found clear (when making a Megger test be sure that all power is off that particular circuit), then you must ask the utility company to assist you by having the company check their transformer for a ground leak.

The transmission systems in the U. S. today are predominantly grounded neutral. The isolated neutral systems are free from interruption due to grounds on one conductor, but were frequently subjected to equipment failures when swinging grounds occurred (arc-grounded phenomena).—O.C.

ANSWER TO P20—If the 3 phase system is ungrounded you would get a voltage reading to ground if there are tungsten lamp ground detectors on the system. If caused by the tungsten incandescent lamps ground detector, small neon lamps or a non-bulky type electrostatic ground detector may be used to replace the tungsten lamps ground detector. This should eliminate the voltage reading to ground.

The differences in voltages at different locations are most likely to be caused by voltage drop in the conductors due to the current being used.—E.B.

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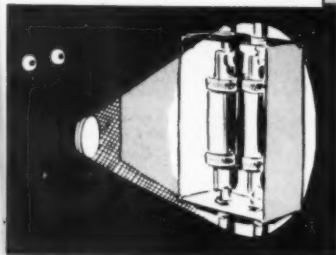
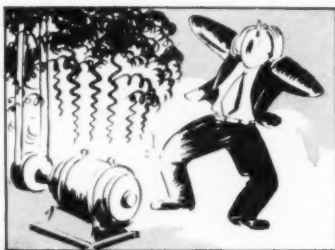
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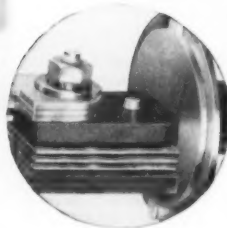
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QUESTION A21—I was recently called in to do a job on a plugging switch and there was some difficulty there that possibly some of your readers could advise on.

In connection with the use of a plugging switch on a 5 hp motor, in order to stop the motor instantly at a given position, it was found that the motor had a tendency to reverse after the plugging switch was depressed. Is there any simple way to remedy this? What was finally done was to add a brake to the machine to add friction, but this does not appear to be a very good solution as power is being used for nothing, merely to overcome the brake friction.—H.H.S.

QUESTION B21—We have an 80-gallon electric hot-water heater that had the elements burned out because the water was drained out of the tank before turning off the current. The switch supplying current to the heater was located at the heater but the draining was done under the floor and the switch overlooked. Could a pressure switch be installed on the water heater or piping so that it would open up the electric service to the heater, if the water was drained out or if the water level got below the level required to keep the element submerged?—E.E.M.

QUESTION C21—How can I install heating cable to melt the ice from eaves and downspouts and yet protect the eaves and downspouts from galvanic action due to contact with the lead of the heating cable?—H.S.

QUESTION D21—What precautions are necessary in cleaning and impregnating silicone insulated motor windings?—D.H.N.

QUESTION E21—We have two 600 hp, 2300 volt synchronous motors, at 240 r.p.m. When starting these motors, auto transformer starting, with discharge resistors across the field, sparks jump between field coils. Does this mean there is something wrong with our field coils or is that just a natural condition? The field does not show any ground.—A.T.

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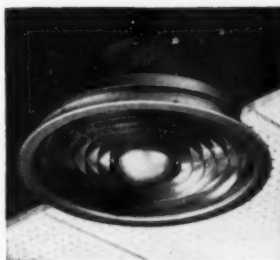
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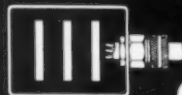
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Questions on the Code

Answered by

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*

GLENN ROWELL, *Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.*

B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*

F. N. M. SQUIRES, *Chief Inspector, New York Board of Fire Underwriters, New York, N. Y.*

Service Equipment

Q. In our area when wiring the modern one story ranch type house, it has become rather common practice to locate the service equipment in the garage and as it seems most convenient for the home owner to have the equipment mounted on the wall between the garage and the home, we have often attached the service head to the gable end of the garage and then run the service raceway across the garage overhead and down the common wall between the dwelling and the garage to the service equipment. Recently we have been asked to mount the service equipment at the point of entry to the building as it is claimed that is required by the Code. Is this true?—B.A.R.

A. Due to the possibility of high voltage surges caused by lightning, transformer breakdown or crossed conductors, the Code has long recommended that unfused conductors not be run within the hollow spaces of a combustible building to prevent the possible ignition of the building in the event of insulation failure. The present Code under Section 2351 a. states that service equipment shall be located at a readily accessible point nearest to the entrance of the conductors, either inside or outside of the building wall. Where this is not practical, under Section 2372 we find the following permission: "The service overcurrent device shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto, unless located at the outer end of the service raceway." In other words, where it is not practical to locate the service equipment adjacent to the point of entry, it would be possible to fuse the ungrounded conductors at that point and then run a set of feeders to whatever location you might desire to place the service equipment.

There are, of course, also instances especially where buildings are entered underground where service raceways may enter a coal bin or similar location

where it would be most impractical to mount service equipment, and where such conditions warrant, most inspection authorities will grant permission to run to the nearest practical location for the mounting of the service equipment.—G.R.

Temporary Underground Wiring

Q. Can Type RH wire be used as underground power feeders temporarily? If so, how long would RH insulation last and what would be the result of breakdown?—D.F.W.

A. Insofar as the N.E. Code is concerned, Type RH wires are not approved for direct burial in the earth even on a temporary basis. Since such procedure would be a Code violation, responsibility for any ill-effects resulting therefrom would rest entirely on the persons sponsoring or making such an installation. The only cable I know of which is approved by Underwriters' Laboratories for underground use is Type USE and even with this cable particular attention must be given to mechanical injury.

Regardless of the foregoing, we know that the moving Carnival has in the past directly buried in a shallow trench Type R conductors and when the weather remained dry and mechanical injury was avoided they appeared to operate satisfactorily. However, when a rainstorm occurred, the picture immediately changed. In several instances the conductors had to be brought to the surface and supported on temporary structures a few feet from the ground which presented a serious hazard.

Type RH insulation is primarily a heat resisting insulation and how long it would function satisfactorily when buried in the ground depends on the chemical composition of the soil, the exposure to moisture, the deteriorating effect of ground worms and the mechanical injury exposure. Since these conditions vary in different parts of the country, it would be difficult to

even hazard a guess as to how long such an installation would function satisfactorily.

In the event of insulation failure, we might obtain a slow leak to ground which among other things might influence your electric meter to produce a bill which could be exorbitant. We could obtain a leak to ground not sufficient to blow a fuse or breaker but of sufficient strength to produce an electrical field that might be hazardous to animals or humans. In the case of a short circuit the overcurrent device would open the circuit. It appears to me, even on temporary work that an approved underground cable should be used and that the difference in the cost for such an installation would be cheap insurance against the possible failures presented by an unapproved installation.—B.A.McD.

Class II, Division 1 Hazardous Locations

Q. Under Class II, Division 1, Hazardous Locations (Section 5054 a-2, Flexible Connections) the code permits the use of flexible metal conduit to be used where necessary to employ flexible connections. The Underwriters' Laboratories, Inc. Electrical Equipment List (Red Book) for Hazardous Locations approves special types of flexible conduit for just such locations. In Article 350—Flexible Metal Conduit—it states that it is not approved in any hazardous locations except in Section 5054 and 5073. There seems to be a direct conflict as to the use of the proper type of fittings in Class II, Division 1.

Why doesn't the National Electrical Code require only listed flexible metallic conduit for this class of Location?—E.C.

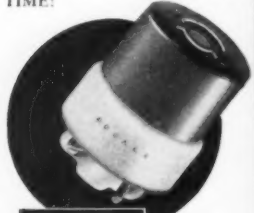
A. It should be noted that Class II, Division 1 locations are subdivided into three groups:

1. suspended combustible dusts,
2. combustible dusts present when mechanical failure or abnormal opera-



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tion of machinery or equipment occurs, and

3. electrical conducting combustible dusts. (Section 5005a).

Basically two groups of dusts are involved. Both groups have in common the characteristics of being combustible, i.e., ignitable and conductive to explosion. The main point of distinction, however, is that one group is a non-conductor of electricity, such as starch, sugar, etc. The second group is of an electrically conducting nature such as coal dust, magnesium, etc.

Section 3502 prohibits the use of flexible metal conduit in all hazardous locations except as permitted by Sections 5054 and 5073. Section 5054-a-2 permits the installation of the flexible metal conduit only for Class II, Division 1 locations where the dusts are not of an electrically conducting nature. The accumulation of these dusts on the flexible metal conduit will not present any hazard. The accumulation of an electrically conducting dust on the flexible metal conduit will permit the dust to be raised in potential, in the event any conductor within the flexible metal conduit grounds out to the conduit. The approved dust tight flexible connectors have an insulating inner wall and this will offer a substantial barrier to the flow of current to the electrically conducting dust if the conductor breaks down within the flexible connection fitting.

Section 5073 permits the use of flexible metal conduit for Class III, Division 1 locations. In general there is no question of electrically conducting or non-conducting materials. Most fibers, flyings or materials classified for Class III Hazardous Locations are in the main not of an electrically conducting nature so that flexible metal conduit may be installed for practically all flexible connections.

The above discussion should clear up any misunderstanding. There definitely is no conflict between these various code requirements.—B.Z.S.

Dead-Front Panels

Q. *Would you be kind enough to point out the Sections in the N. E. Code that specify where dead-front panels, cabinets, and safety switches must be used?*—P.R.G.

A. I know of no definite Code rule which requires the use of dead-front panels, cabinets or safety switches, Section 3803 of the Code requires switches and circuit breakers, with an exception for open face switchboards and panelboards, to be mounted in an enclosure and exter-



GLENN ROWELL, electrical engineer, Fire Underwriters Inspection Bureau, Minneapolis, answers questions during packed all-industry Code Forum at recent NCEI convention in St. Paul. Another panel member, **Martin Streed** (left), Minneapolis chief electrical inspector checks Code wording.

nally operable. Section 2436 of the Code requires overcurrent devices, with some exceptions, to be enclosed in cutout boxes or cabinets. Neither of these rules require the safety protection afforded by dead-front panels or safety switches. Section 2440 of the Code recognizes the hazard involved when handling fuses and thermal cut-outs and requires a disconnect switch ahead of such devices when cartridge fuses are used. Section 2437 of the Code requires enclosures for overcurrent devices used in damp or wet locations to be of a type approved for such locations and some inspection authorities might interpret this rule to require dead-front panels or safety switches. Section 1113 is a general rule covering the guarding of live parts from accidental contact by enclosures or location. It does not, however, require the safety obtained from the dead-front panel. Since the Code is a minimum requirement many engineers, industrial or others, feel the necessity for the additional protection afforded by dead-front panels and safety switches and specify their use. This is considered good practice.—B.A.McD.

Emergency Lighting

Q. *The problem is in connection with emergency lighting. The present plan calls for the regular service from a bank of transformers on a pole across the street from the building. The emergency service from a bank of transformers a block away. However both transformers are energized by the same high voltage line.*

I quote from the National Electrical Code, Special Conditions, Article 700 Emergency Lighting, Paragraph 7011

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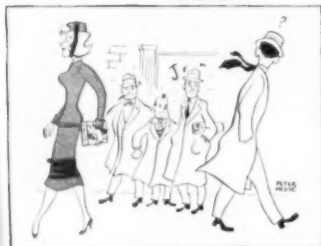
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TWO YEARS of concentrated work went into the revision of the Chicago Electrical Code, Roy Burgess, assistant chief electrical inspector, Chicago, tells Illinois inspectors at recent annual meeting. Code must pass City Council.

sub b; covering one service and a generator set, sub c; services as widely separated, electrically and physically, as the available facilities allow.

Would you rule that sub c would fulfill the code requirements, or would you recommend that we enforce sub b? —D.E.M.

A. There are two schools of thought among inspectors relative to their interpretation of these emergency lighting requirements. Both are based on experiences encountered by the individual inspector in their own localities. Which theory you should apply will depend on many factors which you alone can evaluate. Thus the reliability of the Utility service, the past history of outages, service policy, etc., will have a direct bearing on the decision you will have to make.

One group of inspectors holds to the theory that as long as the integrity of the emergency service is maintained within the building itself, they are not interested in the arrangement of service lines outside of the building. Thus paragraph 7011c is generally accepted by these inspectors as entirely satisfactory construction. Actually, the emergency service and the main service may connect to the same secondary system as long as they are brought in to two physically widely separated points within the building. For example, one service is brought into the rear of the building and the second is brought into the front of the building; or one service is on one side of the building and the second service is installed on the opposite side of the building. In this case the construction as outlined in the first paragraph of the question is quite acceptable provided the physically, widely separated provisions are maintained within the building.

The second group requires complete isolation, both within the building and at the sources of supply. In this specific case the use of the same high voltage system for both transformers presents a moot problem. The two services are "as widely separated, electrically and physically, as the AVAILABLE FACILITIES ALLOW". Whether or not the electrical separation is entirely satisfactory is for the inspector to determine, based on his knowledge of the reliability, etc., of the Utility's facilities.

There is no question in the minds of most inspectors that Section 7011a or b is the most desirable type of emergency lighting supply system. However, economical and other practical considerations must be recognized in the enforcement of these requirements. —B.Z.S.

Lightning Protection

Q. It is the common practice in this rural area to run the service ground from the service head, where the service drop attaches to the building, to the grounding electrode; driven ground, water system or both.

Now if we assume that it is 20 feet from the service head to the point of attachment to the water system; that the No. 6 ground wire has an inductance of .55 microhenry per foot, based on a No. 6 solid copper wire having an inductance reactance of 1.109 ohm per mile, at 60 cycles per second, with 49 feet conductor spacing, and that a lightning stroke with a 1.5 x 40 microsecond wave forces a current of 10,000 amperes through the service ground, then the potential difference between the interior wiring and plumbing systems will be about 115,000 volts. As this is far greater than any interior wiring system can withstand, then, if wiring and plumbing are installed in close proximity a flashover will almost surely result.

The solution would seem to be to either require a certain amount of spacing between wiring and plumbing, or, instead of grounding from the service head, ground from the distribution cabinet fuse box; require that the cabinet be located close to the point of attachment to the water piping, and also, that the point of attachment be located close to where the outgoing pipe enters the ground. I don't find anything pertaining to this in the Code. Will you please give your opinion. —S.W.

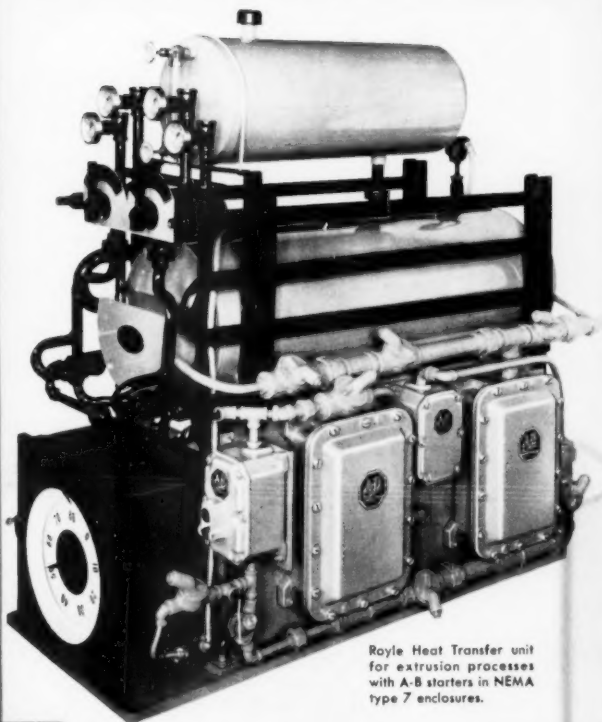
A. The question which you have raised concerning protection from lightning voltages is important especially in rural areas and the N.E.

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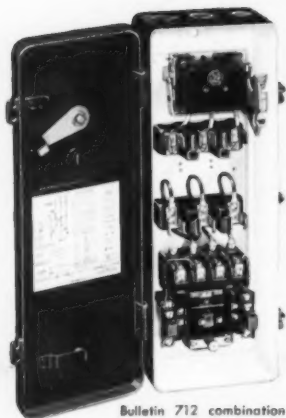
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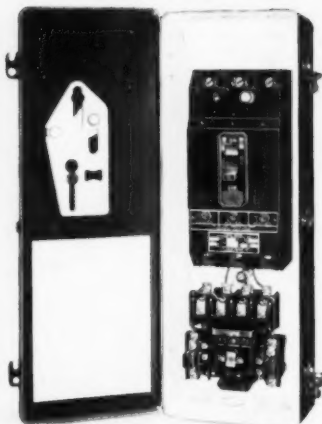


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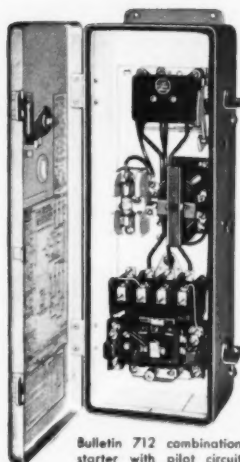
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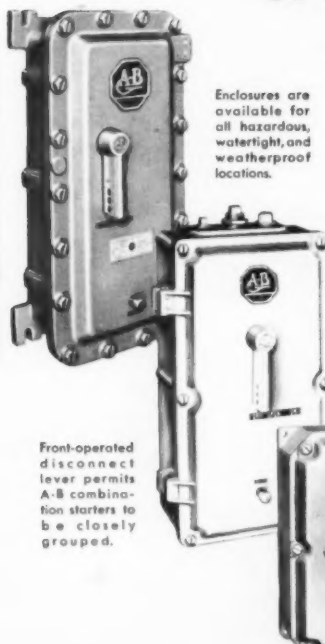


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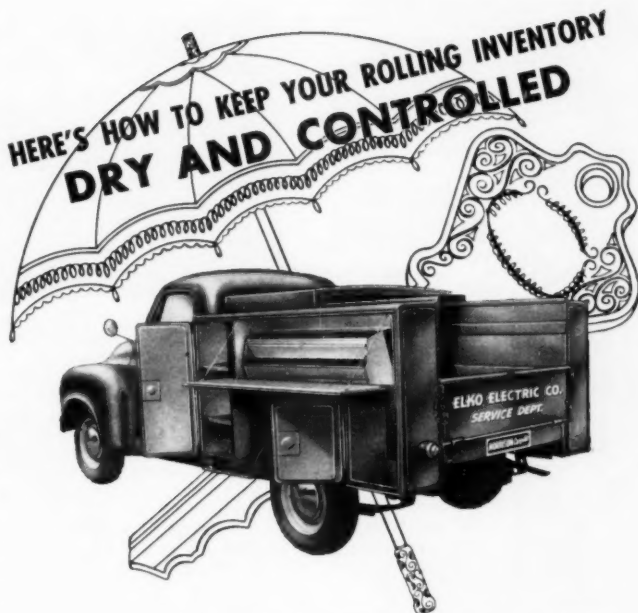


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BULLETIN 712-713 COMBINATION STARTERS

QUALITY

Code has endeavored to safeguard this hazard to a degree consistent with the needs field experience indicates to be proper. In addition to the impedance of the ground circuit to the grounding electrode an important consideration concerns the resistance of the grounding electrode. In rural areas, where artificial electrodes or local water piping systems are used, we face a condition which varies considerably in line with local conditions. Assuming, however, that we are able to obtain a 10 ohm resistance for the grounding electrode and the lightning discharge produces a current of 10,000 amperes, the resultant potential drop across the earth connection would be about 100,000 volts. As a result the potentials on secondary circuits may be raised to a point where insulation failures and arcing results. While the grounding of our secondary ac systems as required by Section 2514 tends to reduce this hazard, it does not, especially in rural areas where artificial grounds are used, offer sufficient protection in many cases. Section 2551 of the Code requires that the grounding circuit shall have impedance sufficiently low to limit the potential above ground, and to facilitate the operation of the over-current device of the circuit. This is a fundamental requirement which is satisfied when the paragraphs following are enforced. Section 2554 requires, under certain conditions, a common ground conductor. Application of this rule minimizes difference of potentials between the secondary circuit and the conduits or other metal enclosures. Section 2581 in the Code requires local water pipe systems to be used as grounding electrodes but if the system does not meet the requirements for an electrode, it must be supplemented by and connected to a standard electrode. This provision which is relatively new satisfies to a degree the large difference in potential which may occur between the electrical wiring and the piping system due to lightning. It would be difficult to have large separations between water pipes and wiring. This provision of the Code will protect motors connected to water systems from failure due to exposure to high voltage. Section 2534 recognizes protection by separation when it requires lightning rod conductors to be separated at least six feet from metal enclosures of conductors. If this is not practicable, bonding is required. It does not, however, set up any requirements for separation as covered in your question for the reason covered above. There is no question regards your suggestions for lowering the impedance of the grounding circuit but the Code authorities have not seen fit to take such action, possibly due to a question of practicability. Since many rural



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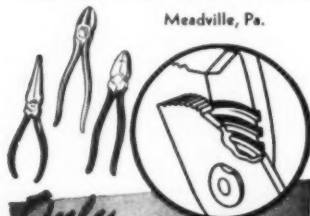
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INSPECTION PROBLEMS in rural districts get airing during huddle between Minnesota State electrical inspectors; (L to R) Abe Paquin, Crookston; Gust Nordling, Morhead; and Elliott Cleland of Brooks, Minnesota.

properties have lightning rod protection, it follows that the hazards involved are further reduced under such conditions.

It is difficult to cover all phases of this problem in the space allotted to Code questions. An article in the May 1945 issue of the News Bulletin of the International Association of Electrical Inspectors, written by A. H. Shimer, fully covers the details involved with diagrams. A copy might be obtained by writing to this Association at 612 N. Michigan Avenue, Chicago 11, Ill. —B.A.McD.

No. 8 Service Conductors

Q. Article 230, Section 2304-a-2 permits the use of No. 8 service conductors due to limitations of supply or load requirements.

Under what specific condition would each of the two limitations apply as the intent of the ruling is not very clear?—E.C.

A. In general the use of No. 6 service entrance conductors is conservative for most installations. This is especially true in those localities where cooking and water heating is done electrically.

However, there are still quite a few localities where electricity is used, in the main, for general lighting, small power (refrigeration) and small appliances (toasters), only, in residential occupancies. The larger loads of cooking and water heating are taken care of by the gas facilities owned by the same utility. Under these conditions, the utility usually designs its supply facilities to take care of a minimum load of general lighting and small appliances. In these locations the No. 8 service conductors have proven to

be quite adequate for the average dwelling occupancies.

There is another class of minimum dwelling occupancy represented by a group of people in almost any community who are far below the average economic level of the community. The electrical load requirements for this group is even below minimum standards of the code. The two circuits minimum as required by the code (one for the kitchen receptacles, etc., Section 2115b, and the second for the general lighting and other receptacles) is more than ample to carry the load which will be used in such occupancies. The No. 8 service conductors (40 ampere rating) will have sufficient capacity for this limited load even if both branch circuits were designed for 20 ampere capacity.—B. Z. S.

Conductor Fuse Protection

Q. From Sections 2403-A and 2371-A of the N.E.C. we understand that fuses up to 150% of the conductor rating may be used for feeders and branch circuits but not for services. Is this your interpretation, and if so, why is it permissible for one group and not for the other?

In accordance with these sections, can new installations be planned to utilize a smaller conductor (up to 1/3 less current carrying capacity) while using the proper rated size switch and fuse? For example, could a feeder use 400 ampere copper but terminate in a 600 ampere switch and fuse?—M.D.

A. Section 2403-A of the Code first appeared in the 1941 edition and, in my opinion, permitted conductors in general to be overfused as much as 50% only when the allowable current capacity of the conductor does not correspond to the rating of a standard size fuse. The rule indicates however, that the next larger size or rating of fuse may be used provided it does not exceed 150% of the allowable current-carrying capacity of the conductor. I believe a comparison of the current-carrying capacity of conductors with the generally considered standard fuse ratings will show that the 150% limit is considerably higher than ordinarily would be required.

While it is my opinion that this rule covers all conductors including service conductors, I do believe that the omission of any reference to this 150% provision under Section 2371-A leaves a question which you have justly raised. In support of my opinion I note under Section 2402 which covers overcurrent protection for equipment, not conductors, that reference is made

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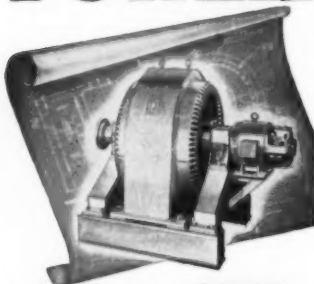
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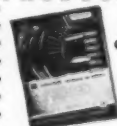
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to Sections 2371 to 2375. This appears to indicate that these Sections cover equipment protection and not conductor protection. Reference to Section 2371-A however indicates otherwise. If the rule in question did not apply to service conductors, we could obtain a combination where a circuit fuse would be larger than the service fuse and I don't believe this was intended since it would be in violation of Section 2373. According to example No. 6, Chapter 10, a motor feeder supplying a 174 amp. load could be fused at 175 amps. which indicates application of the 150% rule. If this rule did not apply to services and this was the only load served, the fuse size must be reduced to 150.

Irrespective of the foregoing opinion, I believe the question you have raised should be clarified and I am bringing it to the attention of the Code parties concerned.

In reply to the second part of your question, the answer in general is, no. There are cases however, where motor loads are concerned that the feeder would be considerably over fused due to the starting current of the largest motor. This is covered by Section 4362.—B.A.McD.

Pulling Wires In Conduit

Q. Is there a definite Code ruling which prohibits the use of a grease when pulling Type T wires in a conduit?—J.S.

A. Section 3013 of the Code definitely recognizes the use of graphic or talc as a lubricant when pulling wires in a conduit. It also recognizes any approved compound for such use, which leaves it up to the Underwriters' Laboratories or the Inspector to decide. It also prohibits the use of any lubricant which has a deleterious (harmful) effect on the conductor. According to Underwriters' Laboratories, some thermoplastic insulating compounds are suitable for exposure to mineral oil. This does not indicate however that a grease or even an oil could be used when pulling Type T conductors in conduit. At the present time U. L. lists two wire pulling compounds that are approved for use as lubricants and both are practically free of oil or fatty acids. Section 3102-c tells us that conductors exposed to oils, greases, etc., shall be of a type approved for the purpose. I believe this is the rule which answers your question, especially since U. L. lists no wire pulling compounds consisting primarily of grease.—B.A.McD.

Official N.E.C. Interpretations

INTERPRETATION No. 381

(Issued Mar. 6, 1952)

SECTIONS 2115, 2116 and 2124—Capacity and Circuit Requirements

QUESTION: Is it the intent of paragraph "b" of Section 2124 that all of the rooms named therein must be wired for electricity if electrical service is supplied to a dwelling?

ANSWER: No, assuming that all provisions of Sections 2115 and 2116 are taken into consideration in computing service, feeder, and branch circuit capacity for the dwelling as a whole.

INTERPRETATION No. 382

(Issued Mar. 27, 1952)

ARTICLES 230 and 250—Service Equipment and Bonding

STATEMENT: An existing installation consists of six divisions, each with individual meters and separate switches with appropriate fuses grouped in one location and connected to a single set of service conductors wired in accordance with the provisions of Article 230 and bonded as required by Article 250.

QUESTION No. 1: If one meter with its individual disconnect switch and appropriate fuses is added, making a total of seven divisions, will this require the installation of a single main fused switch or circuit breaker as the service disconnect means for the entire group?

ANSWER: A single main switch with appropriate fuses or a single circuit breaker would comply with the requirements of Article 230 so long as the provisions of Section 2553 are satisfied. However, a grouping could be accomplished of the seven divisions described, under the control of one or more main service switches or circuit breakers, provided such main switches or circuit breakers did not exceed six in number.

QUESTION No. 2: If a single main disconnect switch and appropriate fuses or a circuit breaker is installed ahead of the seven divisions described in Question No. 1 and such single main disconnect is properly bonded, does the equipment on the load side of the main disconnect have to be bonded as described in Section 2572?

ANSWER: No. The bonding requirements would apply only to the main disconnect means and other equipment on the supply side of such main disconnect means.

QUESTION No. 3: If a fused single main disconnect approved as service entrance equipment is installed ahead of more than six individual meters and their separate controls, can load wires then be run in common raceways anywhere on the load side of the single main disconnect switch?

ANSWER: Yes.

QUESTION No. 4: If a single fused main switch approved as service equipment is installed as the disconnect means, will the requirements of Article 230, Section 2357 apply?

ANSWER: Yes.

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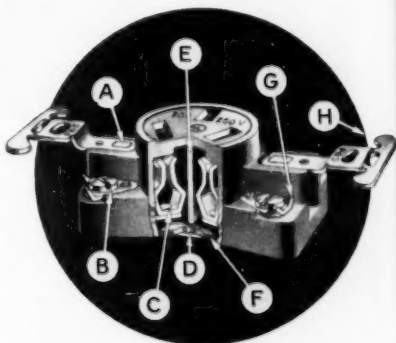
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View of library
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SPECIFICATIONS

Steel channel, parabolic reflectors of diffused Alzak aluminum. Uses two T-17, 40-watt low-brightness lamps. Can be installed individually or in continuous lines, either surface mounted or suspended. (Available on request with steel sides and reflector finished in Leaderbrite baked-on, chip-proof, high reflectance enamel.)

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Modern Lighting

COURTROOM LIGHTING BREAKS TRADITIONS



COURTROOM is illuminated by two-level lighting plan, combining Pittsburgh recessed downlights with Silvray suspended indirect fixtures. Intensities average 15 footcandles in the spectator section; from 30- to 50-fc over the judge's bench and council tables.



CORRIDOR also combines two light sources, with cove lighting augmenting the usual ornamental torchiere treatment. Light level is 10-fc, with the installation having a maintenance factor of 70%.

Analyzing the functions of judges, court clerks, recorders and attorneys prompted the adoption of the logical—but unconventional—lighting plan now installed in the Montgomery County Court House, Norristown, Pa. It is apparent that the area around the judge's bench and council tables should be lighted for comfortable and useful see-ability. Therefore architect E. Lane Crawford, and lighting engineer G. William Wagner of the Philadelphia Electric Company decided to provide between 30 and 50 footcandles for desk top use in the front end of the courtrooms. Analysis further indicated that the spectator section required only normal auditorium illumination in the order of from 10-20 footcandles of general lighting. On this premise, it was decided to depart from the traditional one-level courtroom-lighting concept, and to install a flexible system to meet the dual illumination requirements.

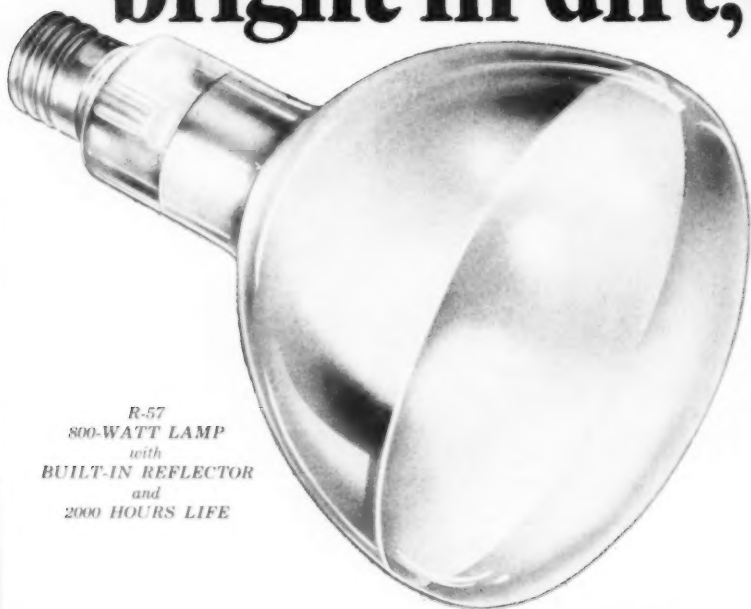
A direct-indirect system resulted, with 500-watt incandescent concentric-louvered downlights recessed flush with the 22-foot ceiling over the desk area, and 1000-watt silvered-bowl indirect units suspended 4½-feet from the ceiling in an overall pattern. While the floor areas of the several courtrooms vary in size, the lighting load averages 6 watts per sq. ft.; intensities on desk tops average 30-50 footcandles, and lighting levels in the spectator sections average 15 fc.

Ceilings are acoustical tile with reflectance factors of 72-75%; walls and woodwork are Colonial Ivory (62% rf). The maintenance factor for the lighting installation is 70%.

The central corridor and marble stairway is also lighted by multiple sources of illumination, for filament cove-lighting techniques are combined with ornamental torchieres mounted on balustrades surrounding the stairwell. Cove lighting consists of Pittsburgh Permalector knockout wiring channel with socket on 1-foot centers to hold 75-watt R-33 reflector spots. Lamps are focused two-thirds of the distance across the ceiling, obtaining a fairly uniform lighting of the ivory white plaster ceiling (85% rf). Approximately 10 footcandles are delivered to the white marble floor.

Wiring was by A. Walter, electrical contractor.

New Westinghouse bright in dirt, dust,



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2000 HOURS LIFE

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NEWS FROM WESTINGHOUSE, THE FASTEST-GROWING LAMP MANUFACTURER

by Sam Hibben



DID YOU KNOW? Owls see in near-darkness (not in total darkness, which almost never exists outdoors) because of the nature of their eyes and not the size of them. Because of two shapes of nerve-ends in the back of the eyeball, we say that humans have both "rod" vision and "cone" vision. The rods take over in dim light while the cones function in brighter light and give us color perception. Owls, cats, and other night-life have mostly or entirely "rod" vision, hence see moving objects in the dimmest lights, because apparently the nerve-rods work in bunches, thus multiplying the sensitivity.

ON THE OTHER HAND—While blackout driving proved possible but unsatisfactory in war-time, the effort of auto safety experts is to approximate daylight seeing conditions as nearly as possible—at least to make roadway objects visible as far ahead as it takes to stop your car—roughly 300 feet. Headlights today are so highly scientific that a pair of small 45-watt filaments illuminate a road area at least 20 times the largest living room. Their complexity is shown by the fact that Westinghouse Sealed Beam Headlamps, for instance, have 121 individual prisms, and all of these direct separate beams of light picked up from various parts of the reflector. I guess that makes them about 60 times as complicated as bi-focals, no?

SAFETY NOTE: If you ever blow a fuse in your car on a busy highway at night, illuminate the interior of your car with a flashlight; it makes the windows visible for a long distance, warns other motorists.

More next month.

Samuel G. Hibben

WESTINGHOUSE LAMP DIVISION DEPT. 533
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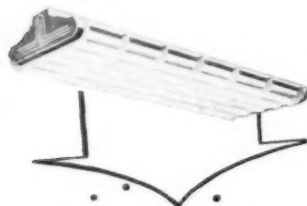


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See Sweet's Architectural File—Section 31A-12

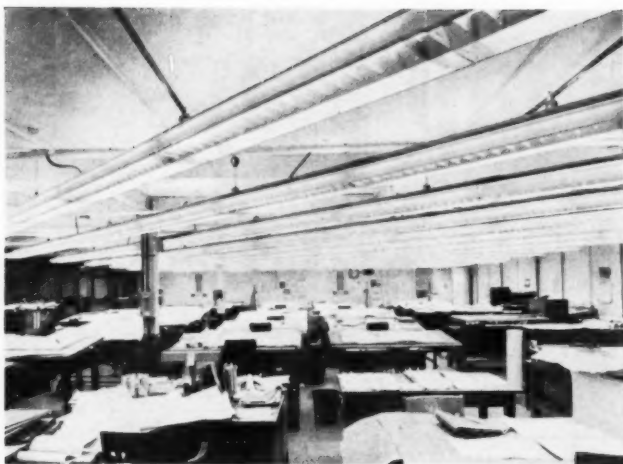
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SEEING IS MADE EASY in this drafting room at the Sheffield Corporation, Dayton, Ohio. Low brightness fluorescent lamps in Guth continuous row semi-direct luminaires were used, installed on four-foot spacings at 45-degree angle to walls. Intensity is 85 footcandles.

Quality Lighting In Drafting Room

The engineering department drafting room of the Sheffield Corporation, Dayton, Ohio, is lighted to a high intensity and features an unusual degree of visual comfort and lighting quality. Semi-direct type luminaires, baffle-shielded and equipped with low-brightness fluorescent lamps, installed at 45-degree mounting, were used to provide this glareless, shadowless, high-level quality lighting.

Ordinarily the lighting engineer on this job would have used luminous-indirect or totally indirect suspended luminaires to provide the quality of lighting desired for this drafting room. But an unusually low ceiling prevented use of this type of suspended units. So, No. M4505/LB Guth semi-direct luminaires were selected, and installed in continuous rows 7 feet from the

floor with rows on four-foot centers. Rows were run on 45-degree angles to the walls to further minimize objectionable shadows from T-squares.

The combination of 40-watt T-17 60-inch low brightness lamps, 45-degree mounting, and a softly lighted ceiling from the semi-direct type units, did the trick. The resulting intensity is 85 footcandles. Brightness ratios are low, and shadows and glare simply do not exist. The lighting result is one of unusually high quality and seeing comfort, ideal for the difficult visual tasks inherent in drafting work.

Don Febiger, lighting engineer for the Dayton Power & Light Co., and J. R. Martin of Martin Electric Co., both of Dayton, Ohio, were responsible for the design and installation of this outstanding lighting installation.

Aluminum Grid For Small Clothing Shop

An aluminum wall-to-wall louvered ceiling over the main sales area of a 19-foot-wide women's apparel shop in Jackson, Mississippi (The Nora Day Shop), has created an illusion of bright roominess. And, coupled with a complete rewiring, redecoration and air conditioning program, it has resulted in increased sales, customer interest and sales-force morale. Spot-lights, both above and beneath the louvered ceiling, highlights manikins, counter tops and special displays, while in-built fluorescent strips illuminate merchandise in wall cases. In

the rear of the small store, in a narrow section with an 8-foot ceiling, recessed fluorescent fixtures flanked by flush-mounted louvered incandescent downlights provide a lighting plan which is functional as well as decorative.

Illumination on counter tops, with only the general ceiling lighting in service, averages 40 footcandles; an intensity which is stepped up 125 footcandles when augmented by the incandescent spots.

The overall grid is suspended 10.5 feet above the floor; 2.5 feet beneath the ceiling. Continuous rows of 4-foot

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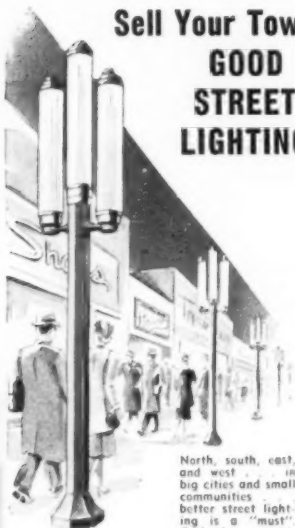
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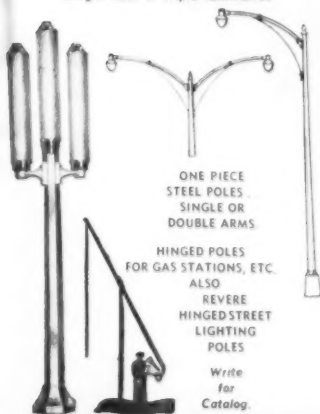


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LOUVERED CEILING, backed by continuous rows of fluorescent lamps on 27-inch centers and rows of 300-watt R-40s over counters, creates bright, expansive, high-key environment in women's apparel shop in Jackson, Miss.

warm white fluorescent are surface-mounted on the ceiling on 27-inch centers, with a line of 300-watt R-40 reflector spots mounted above counters.

Color is generally high-key, with the aluminum grid ceiling, blue-grey side walls, light green carpeting and blond woodwork blending into a low-

contrast combination. Reflectance factors for the various elements in the room range from 65% to 40%.

Responsible for the installation were W. R. Crocket, engineer for the Power Electric Company (contractors), and A. H. Walters, commercial sales engineer for the Mississippi Power and Light Company (utility).



LUMINOUS CEILING at the Hinote Electric Company, Beaumont, Texas, is a 512-square-foot area, comprised of 32 corrugated 4-foot-square sheets of white translucent acrylic plastic supported on a framework of black plywood strips. Corrugations of adjoining panels run at right angles for added decorative interest. Sixteen rows of double-tubed fluorescent fixtures, mounted 15-inches above the Plexiglas, provide evenly diffused illumination. Each row contains one run of 96 T-12 white and one run of 96 T-8, alternately blue and green, making it possible to have either white, blue or green lighting. With the white tubes, an average 95 ft-c level is obtained at desk level, with minimum shadows and specular reflection from merchandise.

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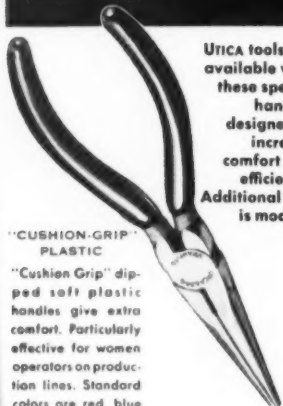
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LUMINOUS CEILING PANELS with a louvered periphery along wall lines of this Virginia electrical contractors' drafting room deliver 56-fc to drawing boards and keeps brightness ratios in the room below 10:1. Contrasts between specific tasks and immediate backgrounds are, in most cases, of lower ratio.

Contractor Specifies Flexi-Module Panels

Glareless, shadowless, even illumination with desk-top intensity of 56 footcandles is found in the drafting room of electrical contractors Biggs & Kirchner of Arlington, Virginia. Practicing their preaching, these advocates of planned lighting designed and installed a job which would not only provide excellent seeing conditions for their own engineers but would serve as an effective promotion aid.

The luminous panels are Sylvania Flexi-Modules, consisting of corrugated plastic in a light metal retaining frame. Single-lamp fluorescent strips are mounted directly to the true ceiling of the room.

A rather unique and helpful feature is the louvered strip seen above the

clock and along the top of the far wall. This has three purposes: to raise the illumination level on the wall surfaces for the purpose of promoting the accurate reading of charts and posted engineering data, to minimize the brightness ratio between the luminous ceiling and the comparatively dark striated wood wall paneling, and to eliminate reflections from the upper walls. Brightness ratios are further minimized through the use of light colored rubber tile flooring. The proof of this thinking is indicated by the fact that, although wall panels have average reflectances below 20%, the brightness ratio for the room is less than 10:1, the recommended ratio limit. For most of the specific tasks, however, brightness contrasts approach lower ratios.

Express Highway Installs Mercury Vapor Luminaires

Those who have witnessed the re-lighting of Chicago's Outer Drive Expressway between Belmont and Montrose Avenues are impressed by the greatly improved visibility. For, although only half the former number of lighting standards are now installed, the level of illumination has been increased by over seven times—from less than $\frac{1}{4}$ footcandle to an average of 1.8 fc. In reducing the number of standards, the output per lamp was necessarily stepped up yet, by raising the luminaires to a height of 31 feet above

the roadbed, glare to motorists is not objectionable or dangerous.

Units are 20,000-lumen mercury vapor, mounted on twin-arm poles along the outer lanes. Spacing between standards is 100 feet.

An interesting detail is the marking of division strips where the opposing lines of traffic are not separated by foliage. This marking follows the treatment used to outline airport taxiways and consists of recessed incandescent lamps protected by tempered-glass caps against possible impact.

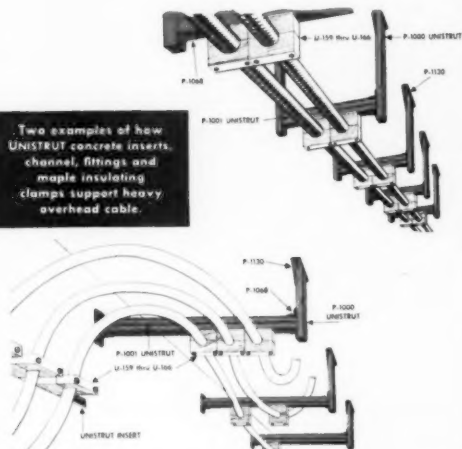
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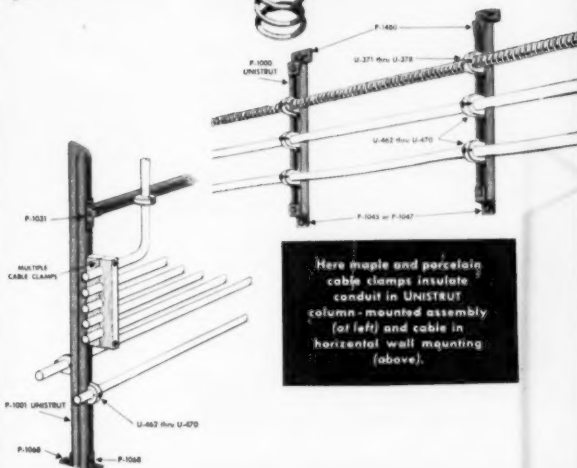
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manpower hours, cuts
overall costs.*

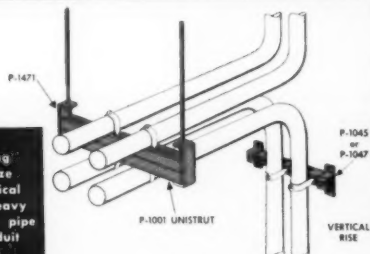
**Two examples of how
UNISTRUT concrete inserts,
channel, fittings and
maple insulating
clamps support heavy
overhead cable.**



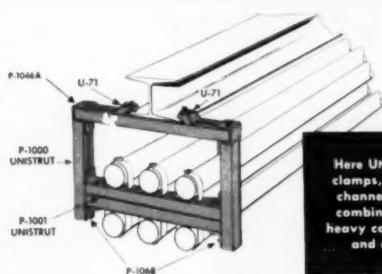
**Here maple and porcelain
cable clamps insulate
conduit in UNISTRUT
column-mounted assembly
(at left) and cable in
horizontal wall mounting
(above).**



**UNISTRUT framing
assembly (trapeze
hanging and vertical
rise) supporting heavy
conduit. Note how pipe
clamps hold conduit
firmly.**

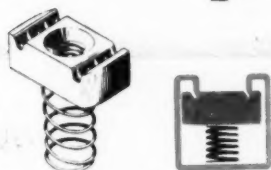


**Here UNISTRUT beam
clamps, pipe clamps,
channel and fittings
combine to suspend
heavy conduit securely
and compactly.**



Only UNISTRUT

offers this Spring-Held Clamping Nut which ties together both sides of the slotted channel and forms a Box Section at points of connection for greater load strength.



UNISTRUT Products are Banderized

**For Defense Production—Every
day the value of UNISTRUT
products is being proved by
their use in Defense Industries
and Armed Services installations
where flexibility, and assembly
and erection speed count most.**



**The World's Most Flexible
All-Purpose Metal Framing**

Write today for your FREE Copy

of New 78-page Catalog No. 700!
Includes above drawings and countless other examples of how to mount, rack, frame, suspend and support all kinds of electrical and mechanical equipment.



UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd.
Chicago 7, Illinois, Dept. E5

Please send without obligation the items checked below:

☐ Catalog No. 700 ☐ UNISTRUT Sample ☐ Wall Chart

Name

Company

Address

City Zone State



*be carefree
with
"Sali"*



- * Install trouble-free wiring
- * Use "Sali" Insulating Bushings on every Conduit Terminal



IMMEDIATE DELIVERY
... Why wait?
LOW PRICE
... Why pay more?
SMALL SIZE



**WEIGHT
3 LBS.**

**"MINOR"
MEGOHMER**
PINT SIZE INSULATION TESTER
500 VOLTS DC GENERATOR

Range 0-50 megohms. True Ohmmeter, independent of generator speed. Furnished with genuine leather carrying case, 6' test leads, 50 megographa.

WRITE FOR BULLETIN NO. 450

HERMAN H. STICHT CO., INC.
27 PARK PLACE, NEW YORK 7, N. Y.



TWIN-ARM LUMINAIRES along the center line and single-armed poles staggered along the outer edges of Chicago's Outer Drive Expressway support 20,000-lumen mercury-vapor luminaires producing 1.8 footcandles of illumination on highway pavement. Curb-recessed lights define separation of adjacent traffic arteries.

While intensity of these division lights is comparatively low, lanes are clearly indicated.

The installation, designed by Fran-

cis D. Wyatt, was installed by the maintenance division of the Chicago Park District. To date, traffic conditions have been improved.

Hibay Reflectors For Texas Coliseum

The central arena area of the San Antonio Coliseum, site of sporting events, pageants, exhibits and conventions, is lighted to an average intensity of 45 footcandles by an installation of Holophane Hibay 691-AL 1000- and

1500-watt reflectors. Mounting height of units is generally 75 feet but, over the position where a boxing ring is frequently erected, a battery of 8 units is mounted at an elevation of 65 feet to produce 70-fc in this action area.



HUGE ARCHED ARENA, with Holophane Hibay fixtures mounted 75 feet above the action surface, is illuminated to average intensity of 45 footcandles. Bank of 8 similar fixtures above boxing ring produces 70-fc when required.

Ready to Install

NO EXTRA PARTS NEEDED



ABOLITE

**OUTLET BOX
REFLECTOR**

The Abolite Outlet Box Reflector permits the installer to connect the unit directly to the junction box . . . thus eliminating extra plates and parts normally used in installation . . . Saves time . . . Saves costs. The Abolite Outlet Box Reflector provides maximum light with the popular "Whiter than White" porcelain enamel reflectors at a minimum cost. Available in the RLM and Shallow Dome shapes in the 12", 14" and 16" sizes the ROB and SDOB units fit any standard junction box.

**ABOLITE LIGHTING EQUIPMENT SOLD
ACROSS THE NATION BY THE FOLLOWING:**

PHILADELPHIA, PA.
H. G. Anchuetz

DETROIT, MICH.
K. T. Beck

KANSAS CITY, MO.
Bettis-Pickie Co.

PORTLAND, ORE.
Bruce-Emmet Co.

LOS ANGELES, CAL.
O. W. Coombs

MEMPHIS, TENN.
O. N. Fussell

ST. LOUIS, MO.
Hawkins Electric Sales Co.

PITTSBURGH, PA.
J. R. Schmidt Co.

MINNEAPOLIS, MINN.
C. H. Jerdee

INDIANAPOLIS, IND.
D. E. Keppler

ATLANTA, GA.
J. A. Lloyd

OMAHA, NEB.
C. C. Mittauer

ROANOKE, VA.
Lynn H. Morris

BOSTON, MASS.
H. W. MacLeod

CHICAGO, ILL.
McKinley-Mockenhaupt

BALTIMORE, MD.
R. G. Montgomery

SYRACUSE, N. Y.
D. K. Post

DALLAS, TEXAS
F. H. Simmer

DENVER, COL.
F. Staible & Sons

NEW YORK, N. Y.
W. J. Wickenheiser

CLEVELAND, OHIO
Wagner-Green Co.

NEW ORLEANS, LA.
Sam J. Watts

TOLEDO, OHIO
T. W. Smith

WILKINSBURG, PA.
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WOBBURN, MASS.
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TAMPA, FLA.
Graham P. Dowling

CHARLOTTE, N. C.
David Long

**SOLD ONLY
THROUGH
ELECTRICAL
WHOLESALE**



THE JONES METAL PRODUCTS CO., West Lafayette, O.

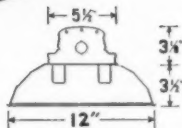
Are you operating on a cost **PLUS** basis?



WHEN you buy or sell industrial lighting fixtures on the basis of the price tag alone, you're likely to discover *plus* costs later that more than offset any initial saving—the *plus* costs of extra maintenance, wasted current, and earlier replacement. Don't buy lighting fixtures in the dark—get the facts and you'll agree: the best way to keep *plus* costs out of the picture is with the

SAMSON

**METALCRAFT'S New
Industrial
Unit**



Ruggedly built of heavy gauge steel, die-formed for uniform construction. Quarter-turn "Shakeproof" wing nuts for easy installation and removal of reflector. Fluorescent or slimline. 2-or-3-Lamp conventional or turret sockets. Porcelain enamel or baked enamel finish. Shielding assembly optional.

WRITE FOR NEW BULLETIN No. SN-1051

the Metal-craft line

METALCRAFT PRODUCTS CO., INC. • Manufacturers of
Fluorescent and Slimline Luminaires • Mascher & Lippincott Sts., Phila. 33, Pa.

With prismatic reflectors directing light downwards with a 30-degree shielding angle, light is economically placed where desired. Tripod holders, gripping reflectors from bottom edges, prevent units from accidentally dropping. And prismatic glass surfaces promote permanence and maintenance ease.

Over the areas, Holophane Lobay 685s are used with 500-watt lamps. These units combine prismatic control of light, true color rendition and sufficient upward illumination to relieve the contrasts immediately above spectators.

The installation was planned by Phelps, Devine and Simmons in association with consulting engineers Hansley and Royer.

Vaporproof Fluorecents For Paint Spray Room

Fast and even spraying of moving parts is facilitated by the 100-foot-candle lighting installation in the enameling department of the A. O. Smith Company in Kankakee, Illinois. Lighting units are vaporproof 3-lamp fixtures manufactured by Benjamin and are installed in three continuous rows. The continuous row immediately above the operators is directed downward, while the two rows behind the operators (one at the ceiling and the other near the floor) are tilted so that light is focussed on the spray area. The installation, engineered by the electrical department of the A. O. Smith Company, is lighted in conformity with recommendations made by W. S. E. Miller, illumination consultant for the Public Service Company of Harvey, Illinois.



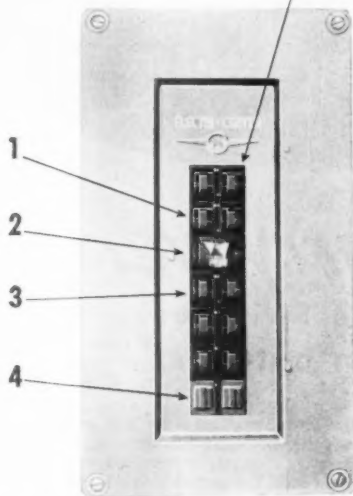
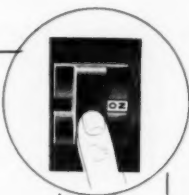
THREE ROWS of Benjamin vaporproof fixtures are focused on spray area to produce 100-fc intensity on moving surfaces being enameled in the A. O. Smith plant, Kankakee, Illinois.

Now . . . *Pushmatic*® protection for the home!

PUSHMATIC PROTECTION AND CONVENIENCE

Here's safe, modern circuit protection unmatched anywhere. Individual interchangeable Pushmatic breakers rupture circuits instantly when short or overload occurs.

Need no resetting. Just a simple PUSH restores circuit (except when short still exists). Foolproof. Trip-free. Listed by Underwriters.



- 1 **MAIN DISCONNECTS**—For service items. Provide individual control over 1- or 2-pole attic fans, ranges, heaters, dryers, etc. Space for 2 or 4 items. (Code permits 6 subdivisions of main service, Art. 230).
- 2 **TIE HANDLE**—Two 50-amp Pushmatics tied together act as a Main Disconnect for all branch lighting circuits in lower section. (Each circuit is protected against overload and shorts by its individual Pushmatic breakers, however.)
- 3 **LIGHTING CIRCUITS**—Space for 8 to 10 circuits, depending on XD Electric-Center model. All are pushed off or on by Main Disconnect, directly above.
- 4 **UNUSED CIRCUITS**—Can be plugged with filler plates until needed.

XD ELECTRIC-CENTERS—Space for either 12 or 18 circuits. Basic device consists of interior, box, front (flush or surface), 4 Pushmatics and 4 filler plates. 100-amp mains. Additional Pushmatics available in 15, 20, 30, 40 or 50 amps. Only 2 basic devices to stock and sell. Get all the details. Write for bulletin.



BULLDOG

New Bulldog XD Electric-Centers give flexible, foolproof circuit protection for lights and service appliances in same panel. Open door to huge domestic market, extra profits for you.

Here's the new Bulldog XD Pushmatic Electric-Center®, a specially designed panel that provides one central control for all circuits in the home, present and future! . . . eliminates the need for individual fuse box and costly main switch by providing for both in a single panel.

Internal split-bus-bar design separates panel into two groups of circuits. Pushmatics in the upper section provide protection and disconnect for 1- or 2-pole service appliance circuits. One Main Disconnect gives master control over all individually protected lighting circuits in the lower section (see 4 points, left).

Of course, famous Bulldog Pushmatic circuit breakers make the XD Electric-Center tops in safety, convenience and flexibility, too. To add a circuit, add a Pushmatic. Safe, trip-free, positive automatic protection always.

Check the features at left. Stock and sell these great Electric-Centers. For complete details write for free bulletin.



Also PB ELECTRIC-CENTERS for homes, businesses

Same as XD Electric-Centers, except that bus bars are not split. Each circuit is controlled individually. Attractive, compact, simple. The last word in efficiency and flexibility. Available in 14 or 20 circuits, single-phase, 3-wire solid neutral or 3-phase, 4-wire solid neutral. Doors available if desired. Flush or surface fronts.

BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

PIONEERS IN FLEXIBLE ELECTRICAL DISTRIBUTION SYSTEMS

1902-1952 . . . SERVING INDUSTRY FOR 50 YEARS WITH FINER ELECTRICAL PRODUCTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . MAY, 1952

167



Automatic Carryover

...keeps Sangamo Time Switches
running during power outages



SANGAMO ELECTRIC CO.
SPRINGFIELD, ILLINOIS



Sangamo Type W Time Switches have a built-in carryover mechanism which operates to keep the switch running during current interruption. Consequently, if power is restored within 10 hours after outages due to any cause, the switches do not require resetting—this saves time and money, especially in the case of remote or inaccessible installations.

Since the carryover feature eliminates the necessity of resetting the time dial after power outages, a definite reduction can be made in service calls. Carryover is widely used where delicate equipment or processes could be harmed by inaccurate timing due to power interruptions.

Sangamo Heavy-Duty Time Switches are built to give many years of exceptionally dependable switching with complete freedom from maintenance worries. There are many good reasons—a few are listed below.

LOW-SPEED MOTOR...

The exclusive Sangamo low-speed motor (450 R.P.M.) means less wear... more years of service.

LIFETIME LUBRICATION...

A special grease assures perfect operation from 50° F. below zero to 200° F. above. No special coils are needed.

OVERSIZE SILVER

CONTACTS... The pure silver contacts minimize troublesome arcing by combining a slow break with a narrow gap.

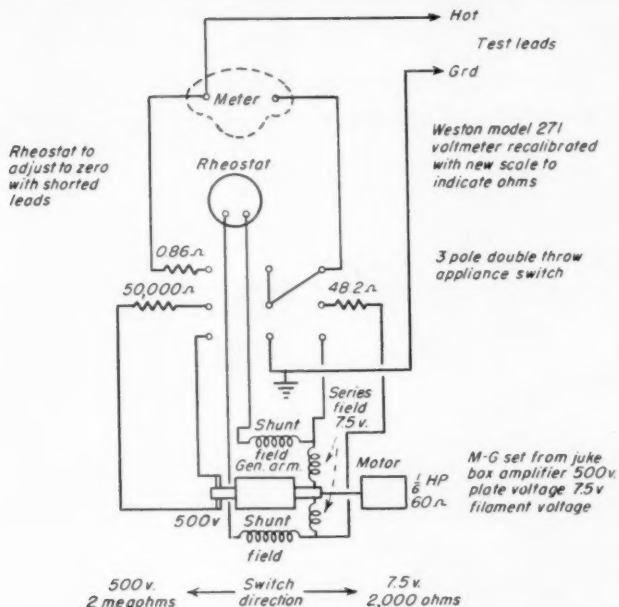
MACHINE-CUT GEARS...

The heavy gears are precision-cut—not stamped. They transmit power smoothly and possess strength in excess of any service requirements.

* * *

Choose from Sangamo's complete line of time switches... Get them at your (sign supply house or) electrical wholesaler. Get the full story—write for Catalog No. 100A today.

Motor Shops



WIRING DIAGRAM of panel-type ohmmeter unit operated by a dual-voltage motor-generator set.

Panel Ohmmeter Speeds Motor Testing

For years, a portable ohmmeter was used at Boustead Electric & Mfg. Co., Minneapolis to make insulation and winding resistance tests in the motor repair department. While there was nothing basically wrong with this procedure, there was always the possibility that the instrument would not be available when a mechanic wanted it. The obvious solution was to build a panel meter that would stay put.

George P. Svendsen hit upon this idea when a motor-generator set from an old juke box amplifier unit turned up in the shop. Here was just what he needed—a generator that would supply both 500 volt (former plate voltage) and 7.5 volts (former filament voltage). Around this unit he designed and built a panel-type ohmmeter giving direct readings from zero to two megohms. A three-pole, double-throw appliance switch, a rheostat, a voltmeter recalibrated in ohms, and a few resistance units complete the component parts of the unit. They are arranged and connected as shown

in the accompanying wiring diagram.

In one direction the switch connects the meter to the 7.5-volt side of the generator and the scale reads from zero to 2,000 ohms; in the other direction, the meter is on the 500-volt side of the generator and the scale readings (multiplied by 1,000) go up to two megohms.

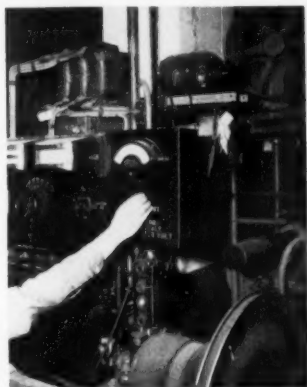
The low scale is used for testing field coils, actual winding resistance (to calculate losses, etc.) and similar tests. Insulation tests between phases and to ground are made on the high scale.

Before actually performing the test, the mechanic chooses the scale he wants to use, then shorts the test leads and adjusts the rheostat to set the meter needle to the zero point. He then applies the leads to the motor parts under test.

Men in the Boustead shop like this new piece of test equipment. The meter is always at the test bench. And, with both hands free, the men find they can run a test in record time.



FIRST STEP is to short the test leads to see if meter needle returns to zero point at desired test voltage.



RHEOSTAT KNOB is adjusted to return needle to zero point while test leads are short circuited. Then test can be made and results read directly on meter scale.

Handy Tool Speeds Coil Winding

Routine coil winding has been made quicker and easier with a simple home-made tool at the National Electric Motor Repair Co., Passaic, N. J. This tool is used to fish and cut string when tying up coils on a coil winder. Andy Anderson, one of the fellows in the shop, conceived the idea for the tool and proved its effectiveness. Now, each man in the shop has one of

Genuine Joe says:

You can reface
Wagner
Commutators
safely...



Genuine Wagner Commutators are rugged—they're designed to withstand great centrifugal force and can be safely refaced. They're high speed tested and are built to last. Features like these assure extra strength:

1. Commutator is insulated from the short-circuiting ring with a mica washer.
2. The short-circuiting ring is made of brass.
3. Short-circuiting ring is insulated from the commutator hub by a bakelite washer that eliminates harmful shaft currents.
4. Wagner commutators have a reinforcing steel shell.
5. The entire assembly is molded in high impact phenolic molding compound.

Write for Wagner Motor Parts Catalog MU-40, and for Fast-Moving Parts Bulletin MU-122. Every repair shop needs these helps.

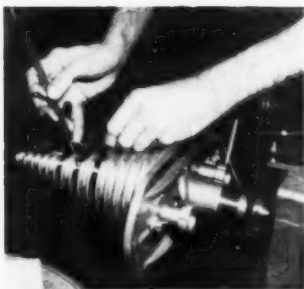


WAGNER ELECTRIC CORPORATION
6413 Plymouth Ave., St. Louis 14, Mo., U.S.A.

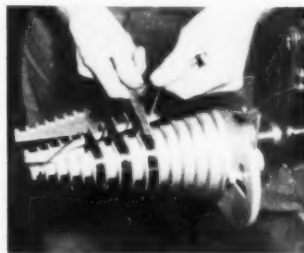
MOTORS • BEARINGS • STANDARD ROTORS
BRUSHES • CAPACITORS • COMMUTATORS

**650 AUTHORIZED SERVICE STATIONS
OR PARTS DISTRIBUTORS**

M552-3



STRING FISHER, made from an old hack saw blade, has a hook on one end for fishing string when tying coils on a coil winder. On the other end of the blade is a sharply ground



KNIFE EDGE for cutting the string when a coil is tied. This cutting edge is ground along the edge of the blade for about two inches.

them, and much time is saved on all coil winding operations.

The tool is simple in construction and can be made in any shop. It consists of an old hack saw blade with a hook on one end and a sharpened edge on the other. The hook is cut right out of the blade which tapers in width toward the hook. A two-inch length of the blades' edge at the opposite end is ground to a sharp cutting edge.

When tying up coils on a winder, the hooked end is used to fish the string from between the coils. As each coil is tied, the tool is flipped over, and the knife edge is used to cut the string.

Insulation Knife Is Old Hacksaw Blade

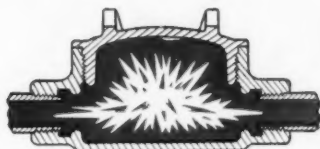
A heavy-duty knife, useful for removing insulation from heavy wires and cables, can be made from a section of a broken or worn out hacksaw blade. Teeth are first removed and the end shaped on a grinding wheel. Next, the blade is drilled in several places to permit the passage of small rivets. In drilling the holes, heat from a torch should be applied to the desired spots

Explosion-Proof CONDULETS

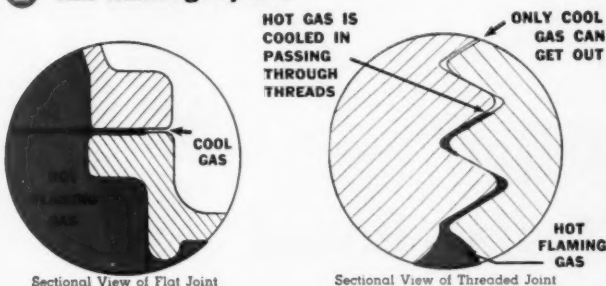
give you **PROTECTION** where flammable atmospheres are present or likely to be present

... because every explosion-proof CONDULET ...

1 Withstands the force of an internal explosion

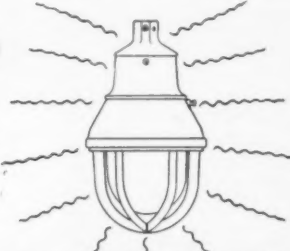


2 Has flametight joints



3 Operates at a safe temperature

**LARGE
RADIATING
SURFACE**



All Crouse-Hinds explosion-proof electrical equipment is built to exceed Underwriters' Laboratories requirements.
Thousands of explosion-proof and dust-tight CONDULETS are listed in Crouse-Hinds CONDULET Catalog.



CROUSE-HINDS COMPANY
Syracuse 1, N. Y.

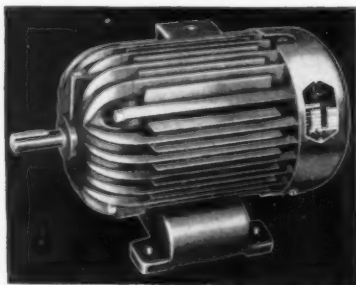
Offices: Birmingham — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Dallas — Denver — Detroit — Houston — Indianapolis — Kansas City — Los Angeles — Milwaukee — Minneapolis — New York — Philadelphia — Portland, Ore. — San Francisco — Seattle — St. Louis — Washington, Resident Representatives: Albany — Atlanta — Baltimore — Charlotte — New Orleans — Richmond, Va.
CROUSE-HINDS COMPANY OF CANADA, LTD., TORONTO, ONT.

***CONDULETS
are made only by
CROUSE-HINDS**

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS



Horsepower with Staying Power



General-purpose motors. Models that give distributors and dealers a widely varied line of *Capacitor-Start*, and *Poly-Phase Motors*.

Special-purpose motors. For pumps, oil burners, fans and blowers. Many will meet most of your customer's specifications "as is."

Write for descriptive literature and full information.

HOOVER®
electric motors

since 1934

There are a lot of different motors with the same rated horsepower. Much the same looks, too. And about the same price.

But put them to work where the going is tough—"torture the truth out of them"—and surprising points of difference show up.

That's why so many distributors and dealers have lined up with Hoover. They've found that Hoover performance is something they can rely on to build business and hold it.

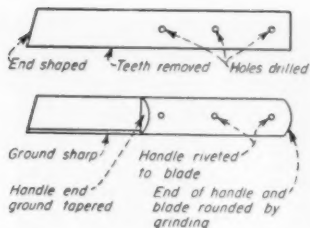
When you put a Hoover Motor through its paces, you find horsepower with endurance. And when you take one apart and look at its "muscles," you easily see why.

In each mile of precision wiring, in every working part, Hoover Motors are built with what it takes for cooler running, quieter operation, more reliable power, longer life on the job.

And Service? *When* it's needed, *where* it's needed, Hoover's service facilities are world-wide—always ready to protect your customers and to guard your good name.

THE HOOVER COMPANY

Kingston-Conley Division
55 Brook Avenue North Plainfield, New Jersey



SECTION OF BLADE from discarded hacksaw is shaped and drilled as shown. Teeth are removed by grinding. After wooden handles are fitted and riveted in place, cutting edge is ground by slow-speed grinding wheel.

so as to remove the temper from the steel.

The handle can be formed from any available wood around the shop; a semi-circular piece being placed on either side of the blade, with rivets passing through the drilled holes to hold the wooden segments firmly. If desired, the handle can then be wrapped with friction tape to provide a non-slipping gripping surface.

The final step is to grind an edge on the protruding section of blade, using a soft, slow-speed grinding wheel and plenty of water to protect the temper of the steel. Overheating should be avoided during grinding, for this creates the possibility of cracking when the blade is immersed in water for cooling.

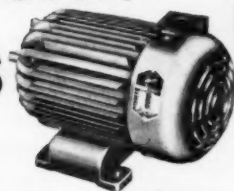
Portable Gas Torch For Stripping Motors

Motors of all sizes are quickly and easily stripped with a portable gas torch at the National Electric Motor Repair Company, Passaic, N. J. In this shop, this method of stripping has proved completely effective and offers distinct advantages over the use of a burning out oven.

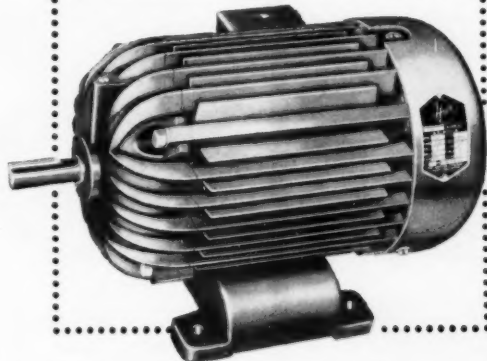
The torch and its auxiliary equipment provide an inexpensive and flexible method for all stripping operations. Illuminating gas is used in the torch, with compressed air at 150 pounds pressure provided by the shop's 5 hp. compressor. The 30-foot length of hose attached to the torch head can be connected to any of three sets of gas and air outlets. Two sets of the outlets are located indoors, one at either end of the shop; the third set is outside the shop.

Many motor shops which for reasons of economy or space limitation cannot afford a more expensive burning out method will find in this torch arrangement a satisfactory solution to their stripping problems. With the torch, the

New Hoover® Motors



totally enclosed



If you make a motor-driven product that must work where there's moisture, heavy dust, wood chips, or metal shavings—these new, totally enclosed Hoover Motors are for you.

And you are getting more for your money than with any comparable motor on the market.

There are both *self-cooled* and *fan-cooled* models—newly designed to keep trouble out and performance high. No openings to let moisture in. No blind passages to catch dust and dirt.

A working giant in a small package

Polyphase motors through 5 H. P. Capacitor start motors through 3 H. P. All built in NEMA frames. Extremely compact. More horsepower for each

pound of motor—more motor for your money in every way.

Made and guaranteed by the makers of the famous Hoover Cleaners, who have been building precision motors since 1934. World-wide service facilities—always ready to protect your good name.

.....
 • THE HOOVER COMPANY
 • Kingston-Canley Division
 • Dept. ECM-5
 • 55 Brook Avenue, North Plainfield, New Jersey
 • Please send catalog showing and describing complete line of Hoover Motors.

Name
 Address
 City Zone State

for **SURE** protective lighting-

INSIST ON

The Austin Line

THE COMPLETE LINE OF FITTINGS TO

PROVIDE SPOT OR FLOOD LIGHTING **where you want it!**

A Few of the Many Standard Austin Fittings



CLU-5



CLUA-21



CLUA-3



CLU-7



CLUA-1



CLUA-Y1



CLW-5



CW-1



BW-1



BWR-1



CC-1



BE-1



CLD-150

"Floating Socket" Lampholder for 150-watt PAR-38 lamps.



CLD-35

"Floating Socket" Lampholder for 200, 300- and 500-watt R-40 mogul base, or medium base lamps with adaptor.



Aluminum alloy.
Completely wired.
Heatproof, weather-proof gasket.

Pat. applied for

"THE FLOATING SOCKET" makes the difference!

As lamp is screwed in, the socket moves forward under spring tension to make a positive contact with lamp base and to insure a snug, even fit of lamp to gasketed rim of lampholder. Prevents lamp breakage due to changes in temperature or physical variations in lamp, sockets, or castings.

Write for Complete Information and Prices

The M. B. Austin Company
NORTHBROOK, ILLINOIS



PORTABLE TORCH provides quick and easy stripping operation in any part of the shop; uses illuminating gas and compressed air and can be connected to any of three sets of outlets, either indoors or outdoors.

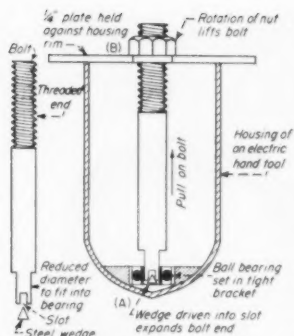
motor housing can be quickly heated and the stator windings softened for easy stripping. The portability of the torch allows its use almost anywhere in the shop, eliminating the confusion and congestion which often occur in a busy shop with cramped quarters.

Slotted Bolt For Removing Ball Bearings

Removing ball bearings from electrical equipment in which the bearings are set in a solid end plate or in some other spot where they cannot be pried loose is a simple matter with a small gadget made up by John Phillips of the Winding Shop of the Boulder Dam Bureau of Reclamation, Boulder City, Nevada. This handy tool has proved very useful in removing Nos. 310 and 312 bearings from the housings of many electric hand tools in which the bearings are set in a tight bracket.

The tool can be easily made from parts found around any shop. It consists of a bolt long enough to reach the bearing in the housing of an electric hand tool and to extend about 2 inches out of the housing. One end of the bolt is threaded for about 3 inches. At the other end, the bolt diameter is reduced to allow a snug fit through the bearing. Then a deep slot is cut in the small diameter end of the bolt. For use with the bolt, a small steel wedge must also be made, and should be of such size as to expand the bolt end when it is forced into the slot.

In use, the tool is quick and simple.



BEARING PULLER, consisting of bolt with slotted end, is driven down on wedge (A), expanding the end and gripping the inside of the bearing. By taking up on nut on threaded end (B), a pull is exerted along the bolt, lifting the bearing out of its tight bracket.

The steel wedge is placed in the bearing and the slotted end of the bolt is brought down on the wedge. When the bolt is driven down on the wedge, the slotted end expands and tightly grips the inside of the bearing. A $\frac{1}{2}$ inch plate with a hole in it is passed over the threaded end of the bolt and held against the rim of the housing for the electric tool. Then a nut is run on the threaded end up to the $\frac{1}{2}$ inch plate. By taking up on the nut with a wrench, a pull is exerted along the bolt, lifting the bearing out of its tight bracket.

The underlying principle of this gadget can be adapted to bearing pulling applications on many pieces of electrical equipment.



ALERT INSPECTORS visit exhibits at St. Paul electrical trade show. Here, Roy C. Reinecke, State Board; S. D. Whitford, Pass & Seymour, Inc., Chicago; Ray F. Braun, executive-secretary, Minnesota State Board of Electricity listen to Ted Mager of Pass & Seymour, Inc., Syracuse, N. Y. Stan Sayre, another State Board inspector watches at right.



For use only as directed in written instructions.

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says Mr. Paul F. Tibbetts, President, Acme Electrical Company, Inc., Needham, Mass.

"With RAMSET SYSTEM, we finish our electrical work before our competitors could even get started. Saves time and money for us as well as for our customers."

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Product Patent No. 2470117. Other Patents pending



"Buyers of these homes get the convenience of G-E Remote Control for about 17¢ a month"



"In planning the Westchester project, I wanted to include as many new ideas as possible," says Burton W. Duenke. "I was surprised to learn that I could offer the luxury feature of G-E remote-control wiring in a \$10,750 home at a cost of about \$35 per home over the cost of conventional wiring."

"I didn't think it could be done," reports Frank Hoog of Hoog Electric Company. "At first, remote-control wiring seemed more of a luxury than an economy. But after we wired the first few homes, I was convinced that G-E remote-control wiring is easy to install and doesn't cost much more than standard wiring."

FRANK HOOG, MISSOURI ELECTRICAL CONTRACTOR REPORTS ON G-E REMOTE CONTROL

"After wiring the first few houses at the Westchester Homes in Kirkwood, Missouri, I was sold on G-E remote-control wiring," says electrical contractor Frank Hoog. "I've got to admit I was a bit skeptical at first. I had an idea remote control was a little involved for an economical installation."

"However, after wiring several jobs I've seen how fast G-E remote control goes in. We wired 119 Westchester homes in Kirkwood, Missouri, in quick time with G-E remote control and we're going ahead with 300 homes in the Ridgewood project at Crestwood and Webster Groves, Missouri."

"The owners are now living in the

completed homes and are enjoying the convenience of G-E remote control for about 17 cents a month. Since this modern wiring system costs only about \$35 more per home than ordinary wiring, they figure it was well worth the small extra cost," continued Mr. Hoog.

"We wired these homes with a master selector switch in the master bedroom for complete lighting control and with individual switches near each light and outlet for local control."

"Considering the way home owners like the G-E remote-control system, I'd recommend that contractors get their share of this business."

3 ways to increase your business with G-E remote control

- 1. CONTRACTOR'S MANUAL** —Thirty-six-page manual gives you all the facts — layout, wiring time savers, and important installation hints. Let this booklet bring you up to date on G-E remote control.
- 2. CONSUMER BOOKLET** —To explain the advantages of G-E remote-control wiring to your prospects, General Electric offers an informative eight-page booklet. Write for a copy of the Remote-Control Consumer booklet, and ask for information on obtaining it in quantity.
- 3. LOCAL ADVERTISING MATERIAL** —A complete package of advertising material has been prepared for use with your remote-control program. Ask for this important selling aid.

For any further information about these selling aids and the use of G-E Remote-Control Wiring see your G-E Construction Materials distributor. Or, write Section D19-518, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

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Data Sheet

Maintenance of High Cycle Tools

How periodic inspection, general condition-ing and effective maintenance measures can assure satisfactory operation of 180 and 360 cycle tools.

Keeping high frequency electric tools in top working condition involves thorough preventive maintenance of the tools, the auxiliary equipment and associated power supply circuits. Maintenance of the tools should include regular inspections, frequent cleaning and prompt replacement of worn or defective parts. For the associated equipment and power circuits, proper care is a matter of periodic check up and effective repair.

Tool Inspection

A schedule for regular periodic inspections should be set up as soon as possible. A simple card record for each tool should show the dates of inspection, oiling and repairs, including the extent of repairs and the due-date for the next inspection. An inspection schedule for any tool depends upon the type of work the tool does and the conditions under which it is used. It is suggested that—

1. Grinders, buffers and sanders with fairly continuous use under dusty conditions be inspected after every 200 hours of use.
2. Drills, nutsetters and screwdrivers with normal usage in areas of less dust and dirt be blown out frequently and inspected after every 300 hours of use.

Procedure for inspection and general conditioning:

1. Check for play in the rotor shaft and work spindle bearings.
2. Check for wear on the pinion and gear.
3. Check the plug, switch and cable for grounds.
4. Check for loose or poor connections.
5. Make necessary replacements and repairs.
6. Change the grease in the gear case.
7. Blow out the live handle and stator with compressed air.

Preventive Maintenance Measures and Trouble-Shooting

In the following discussion, each area of possible trouble in the operation of high frequency tools is

covered separately. Both preventive and repair measures are described.

LUBRICATION should be made a part of the regular inspection. Wipe or scrape all grease out of the gear case, but do not wash with a solvent liquid. Refill the gear case only with fresh, clean grease. Too little grease causes excessive wear on the pinions and gears; too much will cause overheating. Use the lubricant recommended by the manufacturer.

BALL BEARINGS should be checked regularly and replaced as soon as any appreciable wear is noticeable between the inner and outer races. Worn bearings will cause misalignment of gears and can seriously damage the rotor. The use of the best bearings available provides better fit of outer race in seat, better fit of inner race on shaft, better location of all working parts and better concentricity of races.

SWITCHES are subject to the severest service, but their life can be prolonged by

1. Coating all terminals and the inside of the switch handle with insulating varnish, and
2. Blowing all dust from the terminals during periodic inspection.

When necessary, replace switch with the same type as originally supplied. Keep the heavy paper insulation around the switch to prevent arcs and shorts.

CABLE used on 180 and 360 cycle tools is four-conductor type. Standard color coding is:

- Green—ground wire
- Black—first phase
- White—second phase
- Brown—third phase

Cable connections at the switch and plug should be made with soldered terminals or eyelets. All repairs to cable should be soldered. Do not: use excessive lengths of cable; bend the cable sharply at the tool; pick up or carry the tool by the cable; run trucks over the cable.

STATOR replacements are seldom necessary if the correct size tool is selected for the job and if inspection is made regularly and thoroughly. When stator must be replaced, the following should be checked to determine cause:

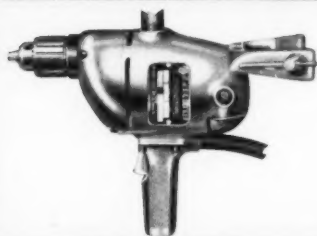
1. Continued overload.
2. Short circuit.
3. Single phasing
4. Damaged cable
5. Faulty or loose connections
6. Low or high voltage
7. Worn bearings that allow rotor to rub on stator

Switch... to Black & Decker POWER

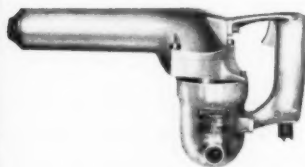


BLACK & DECKER 1/4" HOLGUN* is lightweight, compact, great for drilling in close quarters. It's just one of 25 B&D Drills you have to choose from in capacities from 1/8" to 1 1/2"—with a choice of power, speed and price in most capacities—for faster drilling in wood, metal or masonry.

BLACK & DECKER 1/2" STANDARD DRILL is the world's most popular general-purpose drill. Drives twist drills, Hole-Saws and wood augers for drilling joists and steel boxes; installing switch boxes and switch boards; cutting through switch and terminal boxes in BX work; deep boring in heavy timbers, creosote planking.



BLACK & DECKER 1 1/4" ELECTRIC HAMMER is one of four models that speed up any job involving concrete, brick or stone. These amazingly husky tools drill straight, clean holes for anchors or conduit—dig channels for laying conduit—strip flooring, drive fasteners, clean and scale metal. Drive a variety of tools for bushing, caulking, chiseling, etc. Compact, completely self-contained, operate on AC or DC without transformer or extra equipment.



To make your jobs go **FASTER**, buy these speedy **Black & Decker TOOLS**

See your nearby Black & Decker Distributor for demonstrations of the world's most complete line of portable electric tools. See for yourself how they'll save you time, money and muscle on scores of electrical jobs. **WRITE TODAY** for free, detailed catalog to: **THE BLACK & DECKER MFG. CO.,** 697 Pennsylvania Ave., Towson 4, Md.



B&D RIGHT ANGLE ATTACHMENT helps you drill in close quarters, like reaching out-of-the way places on joists. Transmits full power. Maintains correct spindle speed. Attaches to B&D 1/2" Standard and larger Drills.

B&D HOLE SAWS cut clean, round holes faster—in wood, steel, plastic, fiberboard, alloys. Materials for cutting through switch and terminal boxes in BX work. Fine-tooth, coarse-tooth and high-speed styles—complete range of sizes from 1/8" to 4" diam.; mandrels to fit all electric drills.



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Remove stators only when necessary to replace. Consult manufacturer on stator rewinding or replacement.

HEATING of 180 and 360 cycle electric motors results when too heavy a load is applied. These motors will attempt to carry overloads without loss in speed and will draw excess current from the line. The temperature that results may seem high without being dangerous. Tools should be checked with a wattmeter to discover overloading. Overheating usually results from one or more of these causes:

- Excessive or long periods of overloading
- Dirty ventilating passages
- Low voltage—below 210
- High voltage—above 230
- Worn bearings
- Too much grease in gear case.

SPARE PARTS should be stocked in small quantities. Keep on hand only those parts which require frequent replacement. Bearings, switches and gears are the most frequently replaced parts in all 180 and 360 cycle tools.

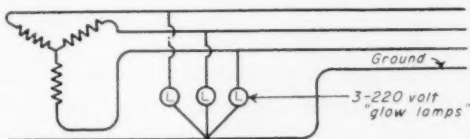
POWER SUPPLY AND WIRING should be checked regularly. All 180 and 360 cycle tools are designed to operate on 220 volts. When the voltage of the high cycle circuits exceeds 240 volts or drops below 210 volts, the commercial power supply should be checked immediately. Voltage fluctuations in the output of the frequency converter should be corrected to avoid high maintenance cost. The frequency changer should have a voltage regulation of at least 8% at 80% power factor.

SHORTS AND GROUNDS in the circuits of high cycle tools can result in blown fuses, damage to the motors, single phasing and damage to the circuits. Because all tools are interconnected by the ground wire, when a short develops, a potential of about 250 volts is built up between the handles, stator case and other metal parts of the tool and two of the three phases. Single phasing occurs when two tools short to ground on different phases. A shorted tool may continue to operate, but it should be detected and eliminated to prevent damage.

Shorts may occur in the cable, plugs or receptacles or in the tools. To locate a short, disconnect one tool at a time until the short disappears. Then reconnect the tool to see if the short recurs.

Grounds can be detected with a 220 volt test lamp. With one test lead in the ground connection at any of the receptacles, check the phases with the other test lead. A ground is indicated when the lamp burns only between ground and two of the phases. If the lamp burns very dimly between ground and all phases, no fault ground is present.

A grounding detector which uses three 220 volt, one watt "glow lamps" may be installed as in the following diagram:



This arrangement offers constant protection. Grounds are indicated when only two of the lamps burn brightly.

SINGLE PHASING occurs in the 3-phase motors of high cycle tools when one phase opens. In this case, the one remaining phase may have to carry an increased load of 70%. Usually the protective fuse will open, stopping the motor. Tools may continue to run after single phasing, but they will have little power and will not start once they are stopped.

When a tool loses power and acts like it's "missing on two cylinders", it should be taken off the line and checked for single phasing.

FUSING PROTECTION for 180 and 360 cycle tools usually consists of time-lag type fuses, used in the plugs and fuse boxes and in the fuse type handles. To assure maximum protection, the manufacturers instructions should be checked.

General Safety Recommendations

High cycle tools are inherently safe, since the speed of the motor is constant and ground connections protect the operator from electrical shock. Nevertheless, ordinary rules of safety should always be observed, especially with abrasive tools.

1. Whenever the job allows, use a wheel guard.
2. When grinding, wear safety glasses or face shield.
3. Use the proper size of wheel and the correct bond for the grinder speed.
4. Do not use wheels larger than recommendations.
5. Make sure that rotation is counter-clockwise; if not, reverse two of the phases at the plug.
6. Keep wheel washer the same size as the wheel collar and the faces recessed.
7. Mount wheel directly against the wheel collar. Do not use washers between the wheel collar and the wheel.
8. After mounting new wheel, start grinder under a bench or other protection.
9. Do not force the wheel onto the spindle.
10. Examine all wheels for cracks before mounting on tools.

Data from The Rotor Tool Company, Cleveland, Ohio.

In The News

NISA'S CHICAGO CONFERENCE

Management and technical forums, equipment exhibits and shop tours emphasized motor repair shop operating efficiency at the 19th Annual Convention of the National Industrial Service Association in Chicago

BACK in 1933 a small handful of electric motor repair shop operators met and formed the National Industrial Service Association to help solve, through united effort, some of the depression-year problems. Last month, approximately 900 delegates and guests came to Chicago's Conrad Hilton Hotel to attend the 19th annual conference of that organization. This time the problems were more complex, the industry was larger and the heavy pressures of an inflationary economy were being felt. The four-day conference drew the largest attendance of any NISA convention.

What pleased the shop operators most were the highly organized forum-type sessions which dealt with management and technical subjects. The formula was simple and effective: a panel of experts on the subject, a limited number of top-notch prepared talks, plenty of time for questions and floor discussion with attendants handling the "roving" microphones. Subject matter followed closely the convention theme "Forward with Fundamentals of Business Techniques." From the free exchange of practical information and personal opinions, delegates absorbed a wealth of information which undoubtedly will find its way into their individual business operations, both at the management and shop level. Coupled with this were the exhibits showing the latest equipment, materials and accessories available for practically every phase of electric equipment repair. Between sessions and at a special exhibitors' night, shop men had the opportunity to visit and revisit the booths to learn more about modern facilities for doing a better repair job in less time.

A full house greeted general convention co-chairman Robert Kaska as he welcomed the delegates to Chicago and officially opened the convention.

Sales administration and general management were the combined subjects on the opening day. Salesmen are the sparkplugs of civilization, Edward McFaul, professional sales consultant of Chicago, told the group. During an invigorating discussion of sales techniques, he stated that there is no magic formula for determining who might make a good salesman—the record is what counts. McFaul indicated he would shy away from the "personality boys"; advised that all new salesmen be thoroughly indoctrinated in products and processes before going on the road; recommended that all salesmen be taught "to ask for the order" before leaving a customer or prospect. Floor discussion revealed a number of shop operators who were using many of the ideas expressed by Mr. McFaul.

John Gros, Power Plants, Inc., Cleveland, questioned whether this country could withstand an enemy atomic attack—from the standpoint of electrical facilities. During a four-month visit to Europe in 1947, Gros noticed that practically all transmission and communication lines were underground and that generating stations were constructed to be indistinguishable from the air. He pointed out the vulnerability of our overhead transmission facilities to attack; urged that every member of the electrical industry offer his community the assistance, advice and cooperation it deserves.

Electrical equipment servicing is growing, calls for plenty of experience, test equipment, handy source of replacement parts and adequate skill. Charles Golenpaul, Aerovox Corp., New Bedford, Mass., told the delegates. More than four decades of selling experience in the service field has led him to believe that a good service man should have the following traits: adequate skill and technical knowledge; enthusiasm, constructive thinking; per-

sonality, initiative and persistence; dependability plus the faculty of charging a justifiably good price for a good job.

While discussing the subject of Mark-up on Costs and Estimating, Selden F. High, Sullivan Electric Co., Cincinnati, revealed that the old rule-of-thumb methods of determining selling prices of motor repairs are totally inadequate today. Overhead fringe benefits to labor and the methods employed today to carry on a successful



MIDWEST ELECTRICAL Council officers elected at recent St. Paul convention are: president—Moreau Bailey (left), Albert Lea, Minn.; and treasurer E. W. Linner, Stillwater, Minn. Not shown are vice-president Berger Indseth, Huron, S. D.; and acting secretary Wm. A. Ritt, St. Peter, Minn.



RECALLING EARLY days in electrical business is contractor Roy Hughes (right) who is still active in Mitchell, S. D. Recipient of a 50-year certificate at St. Paul electrical industry convention, Hughes tells his experiences to contractor L. H. Stemen of Burlington, North Dakota.

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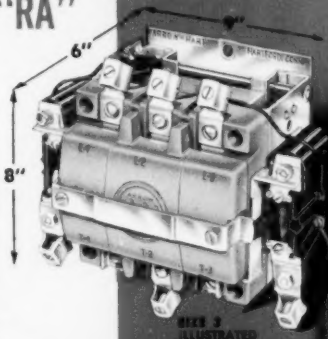


TYPE "RA"

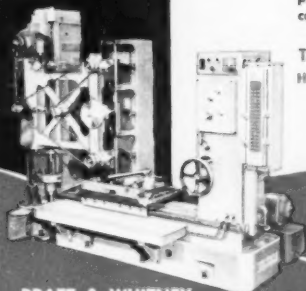
Magnetic MOTOR STARTER

Leading manufacturers of a wide variety of electrical equipment have recognized the ability of Arrow-Hart "Right Angle" Motor Controls to bring out the in-built performance of their top quality, electrically powered and operated tools and machinery. They are taking advantage of the many advanced "RA" features to provide their customers with more compact, more convenient control panels; greater controllability; and added performance.

THE ARROW-HART & HEGEMAN ELECTRIC CO.
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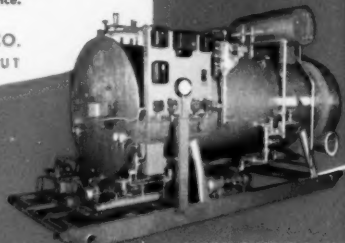
SIZE 2
ILLUSTRATED



PRATT & WHITNEY

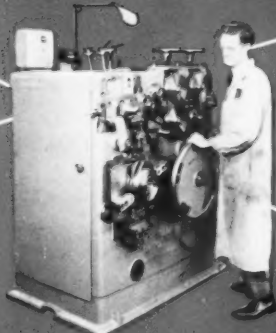
This machine automatically duplicates dies exactly and economically. Compact A-H controls are centered in a tower for maximum convenience.

JUST A FEW OF THE MANY FIRMS
TO ADOPT "RA" CONTROLS



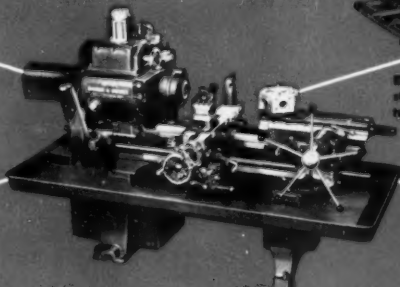
YORK-SHIPLEY, INC.

Electrical and pressure controls for this 100 hp steam generator are centralized in one unit on a control panel. "RA" Starters make this possible.



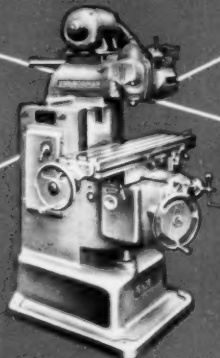
THE TORRINGTON MFG. CO.

A wide variety of springs are precision formed on this automatic coiling machine. Compact "RA" Starters are standard control equipment.



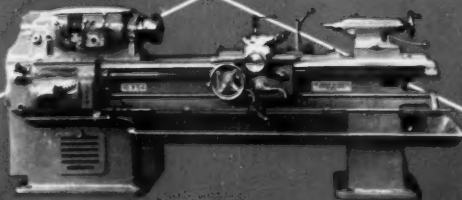
WARNER & SWASEY COMPANY

Legend clocks for high precision machine tools. A-H "RAS" Multi-Speed Starters control this Warner & Swasey No. 4 Universal Turret Lathe.



VAN NORMAN COMPANY

A-H Controls, conveniently grouped for easy operation, help to bring out the top performance built into this run-type miller.



HENDY MACHINE COMPANY

On this versatile 18-speed lathe, A-H Reversing Starters provide precise control and motor reversing for tool, gauge, die and left-handed work.

WHEN YOU REPLACE . . . MODERNIZE WITH

"RIGHT ANGLE"

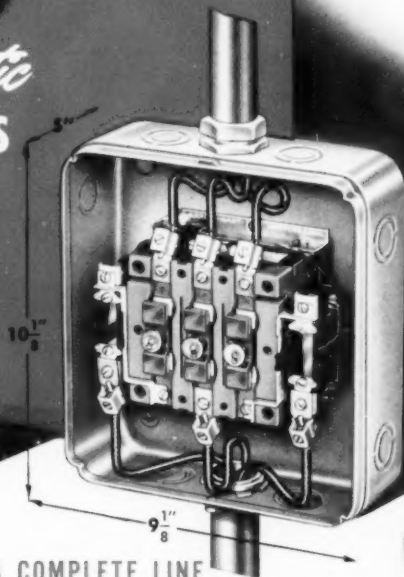
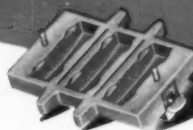


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ADVANCED OPERATING MECHANISM

The exclusive Arrow-Hart "RIGHT ANGLE" operating mechanism is the first real advance in starter design since the introduction of the original solenoid type. Size and weight reduced by $\frac{1}{2}$, and operating efficiency and dependability are greatly increased. Replace today with tomorrow's starter, the "RA."

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Here are opportunities for time, work, and space savings up to 30%. Installation time is greatly reduced; maintenance is easier and faster. Arrow-Hart Straight-Thru Wiring is an exclusive, in-built feature, **NOT** just a bus-bar arrangement. Only A-H can offer you all these important advantages: safer direct routing with greater separation of line and load; immediate certain identification of circuits; no need for crossing, looping or U-bending; no load terminal on the line side.

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business involve additional cost and additional taxes which deplete return. Other costs besides labor and materials should be collected and should be determining factors upon which mark-ups are predicated, he added. The only sure way to cost a job is to use actual time and material data on that job, with an allowance for material loss on inventory, then include the total overhead burden and return, he cautioned.

Technical Forums

The second and third days of the conference were devoted primarily to technical forums. The subject of Random Wound vs. Form Wound Coils in motor repairs was comprehensively investigated by C. J. Koch, manager, Schenectady Motor Engineering Divisions of the General Electric Company. He discussed the advantages and disadvantages of both types from the standpoint of the motor designer, user and repair man. While the random wound coils (mush coil) were formerly used primarily in smaller motors (maximum of 30 hp., 4-pole, 1800 rpm. size in 1924), they are now found in motors up to 125 hp. rating, Koch revealed. And there is a possibility of this trend extending to higher ratings and voltages, he noted. With the development of synthetic varnishes and "formex" type of wire, the cost picture shifted in favor of the random windings, Koch added. Other factors affecting this shift: wider buyer acceptance of random windings; de-emphasis of individual coil repair; expansion of motor repair shop service facilities; and the speed with which shops can now make repairs.

How far can you "uprate" a motor rewound with silicone (Class H) insulation and what will be the effects on the motor characteristics? Shop men attending this session found the



AT AMES, IOWA, electrical estimating school of the Iowa Electrical Association, W. O. Dahlstrom (left), Bryant Electric Co., Chicago, checks wiring device listings with contractors I. L. Brown, Charles City; A. J. Clark, Marshalltown; and W. H. Warner, Tripoli, Iowa.



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For rigid or thinwall conduit. Exclusive self-holding feature saves time on the job, eliminates fumbling and dropping, makes difficult installations easier. Made of heavy gauge steel, zinc plated after fabrication. Wide range of sizes for rigid and thinwall conduit. (Patent Pending.)



Blackhawk No. 470 Connectors

Made of special cast alloy. Strong, durable and non-rusting. Precision finished with full positive threads. Formed steel clamp and solid steel locknut with positive locking feature are heavily zinc plated. Full length filister head tapered point screws make installation quick and easy. No. 470 for "ABC" or flexible conduit. No. 425 for non-metallic cable.



Blackhawk No. 1426 Conduit Entrance Caps

Special high strength non-corrosive aluminum alloy. Easy and positive to position. Filister head cap holding screws. All threads are clean and full cut. For 2, 3, 4, or 5 wire service.



Blackhawk No. 711 Service Entrance Cable Heads

Features cast alloy body with separate cover. Heavy steel cable clamp. Large keyhole saves time, permits quick and easy attachment to building.

Blackhawk No. 3626 Steel Clad Wire Holders

Made with heavy steel base and supporting strap. No. 22 square shoulder screw. All metal parts are hot dip galvanized. Porcelain has compression strain only. Smooth rounded surfaces protect wire insulation. REA approved.



Blackhawk No. 514 Yard Lights

Highest quality porcelain enamel reflector, independently mounted. Zinc plated cast iron head and flange, galvanized conduit extension. Wired with porcelain socket and No. 14 TW wire.

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Entrance Cable Fittings • Staples • Yard Lights
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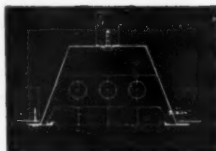
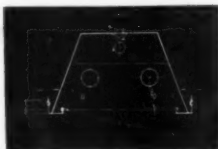
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answer in a paper presented by Gordon E. McIntyre, electrical engineer, Dow Corning Corp., Midland, Michigan. Based on a series of tests made on standard motors, first with their original Class A insulation, then after being rewound with Class H insulation, McIntyre reported the following: Class H insulation will permit continuous motor operation at total temperatures of at least 200°C., which should permit a considerable increase in motor rating. Actually, a minimum of seven years insulation life, at a total hot spot operating temperature of 225°C., should be expected with Class H wound motors, he revealed. While there are no hard and fast rules on uprating of motors with Class H insulation, tests and case histories indicate that it is practical to operate such units at a 50 percent increase over their Class A insulation rating. Although there may be some undesirable characteristics such as increased no-load and starting current, the other and more important motor characteristics remain satisfactory, McIntyre concluded.

Success in the fractional horsepower motor repair business if the shop is operated efficiently with modern equipment, skilled mechanics, a production line setup, and the necessary volume of business (particularly large quantities of similar motors) to keep the shop operating continuously. This is the belief of Joseph H. Previty, Penn Electric Motor Co., Philadelphia, who outlined eight specific steps he uses in his shop. Warranty service, sales and service contracts all contribute to volume. This, plus over-the-counter exchanges and sale of belts, pulleys and other items should be considered by the sales minded shop operator, Previty concluded.



IN CONFERENCE during North Central Electrical Industries electrical industry convention in St. Paul, Minn., are officers of the North Dakota Electrical Contractors Association: (L to R) vice-president—H. K. Junge, Sr., West Fargo; president—A. O. Holmes, Minot; and secretary-treasurer—L. C. Oeder, Bismarck.

Motors with built-in protection against burn-out are better for the customer (less costly repairs) and for the motor shop operator (larger margin of profit on minor repairs and parts), stated W. L. Hirschberg, Jr., Spencer Thermostat Division, Metals and Controls Corp., Attleboro, Mass. Based on a recent study by this company of almost 2,000 motors in two southern motor repair shops, Hirschberg found that 53.5 percent of motors coming into the shops without inherent protection were burn-outs; only 10.4 percent of units with inherent protection were burned out. After presenting details of the survey, Hirschberg concluded that the more profitable minor repair business will predominate in those shops whose customers buy and use inherently protected motors; that shops should install such units to reduce "comeback" burnouts and increase customer goodwill.

Many motor repair shop operators have been tempted to get into the transformer repair business. Some have tried it and dropped out again; a few have been very successful. Charles Covington of Dowzer Electric Machinery Works, Mt. Vernon, Ill., one of the larger midwest transformer repair organizations, had a few words of wisdom for those contemplating entering this field. The territory is different from that covered by a motor repair business and sometimes encompasses a multi-state area. Customers are the electric utilities, REA Co-op's; industrial plants and municipal power plants. Volume is a *must*. While a transformer shop could operate profitably on a \$60,000 annual volume a few years ago, rapid increased cost of material and labor makes a \$200,000 annual minimum volume necessary today, Covington noted. Toughest competitor in this field is the "captive" shop where cost records are prone to be somewhat incomplete and misleading, he added. All major manufacturers, with two exceptions, are cooperating with well qualified transformer repair shops, Covington noted. He believes more work will be directed to the independent shop in the future.

High frequency testing can be a big asset to the motor service shop, according to Samuel Heller of Consolidated Electric Motor Co., New York City. Heller described a 600 cycle, 500-volt test set he constructed for use in his shop; outlined several test procedures and noted many instances where hi-cycle tests uncovered motor defects which could not be determined otherwise. He also uses the unit for transformer testing.

Joseph F. Ferrari, Excel Electric Service Co., Chicago, reviewed the

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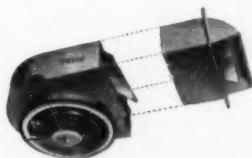
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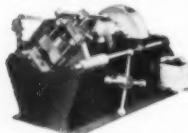
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NISA Electric Motor and Generator and Transformer Rebuilding Standards; urged member shops to publicize and use these standards more effectively; noted that the American Rating Association has come out with a similar set of standards for all rebuilt equipment which it sells to its members.

Following each group of talks on related subjects, delegates asked and received answers to numerous technical questions during the extended forums.

Business Session

This year, the annual business session was combined with a conference luncheon. M. F. Zach, in his president's report, outlined the progress made by the association during the past year; revealed the unusual interest in the Award Contest resulting in an all-time record of some 80 entries. Newly elected president Rudolph A. Scherer, Indianapolis, urged delegates to modernize their shops; noted that lack of modern facilities in independent shops force equipment manufacturers to establish their own service centers. To establish a modernization fund, Scherer suggested that shops set aside in a separate "modernization account" all money received from the sale of scrap copper and metal.

Unanimously approved were several resolutions urging Congress to: permit the Defense Production Act to expire on June 30, 1952; to reduce Federal expenditures; to give government agencies only the "necessary" priorities in the materials markets. Should DPA be extended, NISA, through approved resolutions, requests that electric service and repairs be excluded from Ceiling Price Regulation 34 and that sale of used and rebuilt electrical equipment be excluded from list under OPA Ceiling Price Reg. 105. Another resolution condemning the action of the President in seizing the private properties of the steel companies was also approved.

Winners of the annual NISA Awards Contest were: First Prize (\$100)—Stanley E. Phillips, Vancouver, B. C., Canada, for a patented Inside Caliper. Second Prize (\$75)—John A. McKibben, Industrial Electric Machine Co., Independence, Kansas, for a stator coil stripping machine. Third Prize (\$50)—J. Olin Johnson, Southwest Electric Co., Oklahoma City, Oklahoma, for a shaft straightener. Fourth Prize (\$25)—Leslie Biehl, Biehl Electric Co., Chicago, for a simple dereeler for 12-inch wire reels. Ten Honorable Mention awards of \$10 each were also made to deserving entries.

New Officers introduced at the session included: President—Rudolph A.

Scherer, Scherer Electric Co., Indianapolis, Ind.; vice president—William M. Hogue, Larsen-Hogue Electric Co., Los Angeles, Calif. C. R. Durand, H. N. Crowder, Jr. Co., Allentown, Pa., is treasurer. Howard A. Lilly, Tampa Armature Works, Inc., Tampa, Fla., is secretary. Fred B. Wipperfman is executive secretary. New Directors include: Frank Ross, Fairmont, Minn.; John W. Overton, Richmond, Va.; and Edward Potter, Lima, Ohio.

A theatre party, plant and motor shop tours, dinner-dance and museum tours rounded out the convention agenda for the men. The ladies were royally entertained during the sessions with radio broadcast tours, shopping experiences and a generous taste of midwest hospitality.

1952 Construction

A gradual easing of the supply of building materials and of NPA construction controls means that building construction should reach a fair state of normalcy by year's-end, or 'ear' in 1953. Industrial expansion for de-



ELECTRICAL MAINTENANCE Engineers Association of Southern California drew a huge crowd at their recent 6th Annual Industrial Electrical Show and two-day Technical Forum in Culver City on subject of Planned Productive Maintenance. Outstanding exhibits were selected by Los Angeles Purchasing Agent's Association. Winners of Award Certificates, presented by the Industrial Advertiser's Association of Southern California were: U. S. Electrical Motors, Inc.; Insulation & Wires, Inc.; and F. J. Airey Company. Director of the show was contractor Richard Rogers of the Ace Day & Night Electric Co.; conference chairman was Leon Dame, Southern California Edison Co. Banquet speaker was Joe St. Andre, electrical editor of *Factory Management and Maintenance*.

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fense production facilities will continue to receive top priority and first call on all materials required—especially direct military, atomic energy, chemical and petroleum projects. But other industrial and commercial projects, previously deferred, are now getting the green light, with DPA and NPA approvals and allotments of CMP metals as supplies become available. Even home building, curtailed sharply in 1951, is once again hitting its stride. March starts on new dwelling units totaled 98,000 or 4,000 above the year-ago level, and topped only in record-breaking 1950 when starts in March totaled 117,300.

An indication of relaxation of controls and of the increasing availability of materials is seen in the NPA approvals for industrial expansion and commercial construction for the current second quarter of 1952. Industrial expansion applications were approved, and allotment of materials were made for the construction of 1,458 country-wide projects, the estimated cost of which will exceed \$7-billion. This estimated cost is the overall cost of the individual projects, and not just the value of the second quarter allotments of materials. Some of the projects will extend over a period of a year or more.

NPA pointed out, however, that 1,253 applications for new starts in industrial expansion programs with an estimated cost of approximately \$6-billion had to be deferred for action to the third and subsequent quarters because of the exhaustion of available materials for the second quarter.

A total of 1,599 commercial construction projects throughout the United States, with an estimated cost of over \$726-million were approved by NPA on second quarter applications, and carried allotments of materials for this and succeeding quarters. Applications for second quarter allotments of materials for commercial construction projects totaled approximately 2,700, NPA announced, with an estimated cost of \$1.25-billion. About 1,100 projects had to be deferred for future action however, due to lack of available materials in this quarter.

Both DPA and NPA have recently stated that virtually all applications on hand for both industrial and commercial construction projects will be approved and allotment of materials will be made in the third and subsequent quarters.

Builders are being urged to submit their new applications to NPA as soon as possible so that preliminary planning may be accomplished and the project be in engineering readiness when materials become available.

A geographical breakdown on the



THE FALLACY of estimating residential wiring on a "per outlet" basis gets a boost from Wayne True (left), Watertown, S. D., president of the South Dakota Electrical Contractors Association; and contractor E. L. Sorben of Wessington Springs, S. D.

commercial construction approved showed California leading the country with 254 projects costing more than \$146-million. New York was second, with 156 projects costing more than \$118-million. Each of these areas had previously been classified by NPA as hardship areas; hence were given special consideration for the alleviation of unemployment in the building trades brought about by lack of defense industrial expansion construction and the slack in ordinary construction due to NPA construction regulations.

DPA reported that the facilities expansion program for defense production, aided by the issuance of certificates of necessity for rapid tax write-off provided for in the Revenue Act of 1950, was about 52% in place as of the end of March 1952. These projects are expected to be virtually completed and in operation by the end of 1954, according to the schedules of the reporting companies involved. However, the major portion (94%), is scheduled to be completed by the end of 1953, and 63% by the end of 1952. Facilities scheduled to reach completion after 1954 are mainly long-range development of ores, DPA said.

Machinery and equipment account for the great bulk (65%) of the cost of expansion assisted by certificates of necessity, DPA reported. Construction costs account for 31%, with the balance of 4% going for land and overhead expenditures.

As of April 16, 1952, certificates of necessity had been issued for 8,738 new or expanded facilities on projects having a total value of \$17,579,618,000. Of this amount DPA declared \$16,701,156,000 eligible for certification, of which \$10,717,732,000 or approximately 64% was certified for rapid tax write-off.

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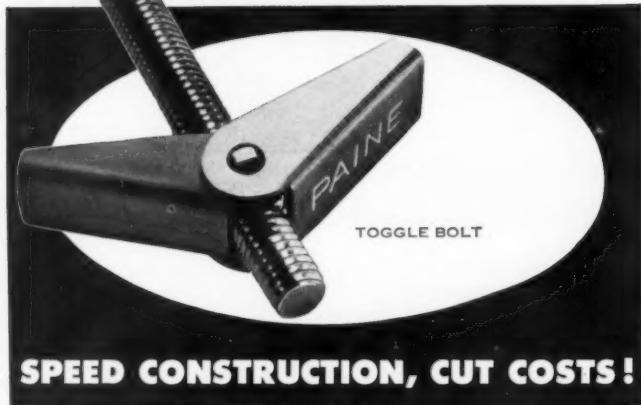


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CHECKING CONNECTORS and boxes at Tomic Sales and Engineering exhibit at St. Paul electrical trade show are: (L to R) contractors Fred and Emil Wiese, E. Wiese Electric Co., Lakefield, Minn.; R. Colberg, Midwest Electric Co., Minneapolis distributor; and Francis Judge, Worthington, Minn., contractor.

The supply of structural steel which will be available for commercial construction in the third quarter of 1952 will be considerably more than double that available in the second, DPA has announced, barring any further curtailment in the production of steel. This has been made possible due to the fact that the peak of the excessive demand for critical materials for the industrial expansion program will have been reached during the second quarter. Schools and hospitals and public roads will get substantial increases in allotments of this steel.

Builders of primary and secondary schools, and of public roads, will be permitted to self-authorize considerably more critical materials for individual projects after July 1, 1952, NPA announced recently. This will be made possible through an adjustment in construction regulations, specifically under an amendment to CMP regulation 6. Builders of schools will be permitted to self-authorize up to 50 tons of carbon steel, of which seven tons can be structural shapes, 1,000 pounds of copper and 1,000 pounds of aluminum. These amounts will be per project—not per quarter.

Similarly, the increase for public roads will be up to 25 tons of carbon steel of which 12 tons can be structural shapes, and 200 pounds of copper.

E.E.I. Announces Ind. Elec. Council

Formation of an Industrial Electrification Council was announced by the Edison Electric Institute at the Institute's annual sales conference in Chicago. Purpose of the Council, according to J. Reed Hartman, chairman of its Executive Committee, and Merrill E. Skinner, chairman of the com-

mercial division general committee of E.E.I., is to foster and coordinate the dissemination to American industry of factual information on the application of electricity and electrical apparatus to industrial processes and other manufacturing operations. Thus industry as a whole could gain a wider knowledge of the opportunities to increase production, improve quality and reduce costs through the widest economic use of electrical energy.

The Council will function as a coordinating agency under which various educational and promotional programs carried on separately by individual companies will have guidance and direction. Membership will be open to all operating electric utility companies and all manufacturers of industrial electrical equipment.

Because of the vast field of industrial electrification, the Council is restricting its initial operations to industrial electric heating, but expects to expand into other branches of the field as organizational details are further developed. Currently, a committee is studying the uses and application of metal sheath heating units and devices; will eventually develop an educational program which can be jointly undertaken by all utilities and manufacturers of this type of equipment.

J. Reed Hartman, vice president, The Cincinnati Gas & Electric Co., is chairman of the Council Executive Committee consisting of six members. Three represent utilities, and three represent manufacturers. Council operations will be carried on through a Planning Committee to develop and coordinate overall programs and task committees to redevelop programs in specific fields. Headquarters are in Room 2650, 420 Lexington Ave., New York 17, N. Y.

To electrical contractors, formation of this Council should be good news. For it is they who will be called upon to install this equipment and provide the electrical service and circuit facilities for its operation.

Greve Heads Minn. Inspectors

Herman Greve of Brainerd, Minn., was elected president of the Minnesota Electrical Inspectors Association at the recent annual meeting of that group. Completing the slate of new officers are: Benedict Lepinski of Buffalo, Minn., as first vice president; and John Warkentine of Mountain Lake as second vice president. Glenn Rowell of Minneapolis was reelected secretary-treasurer.

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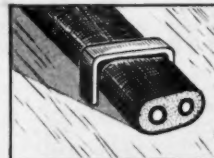
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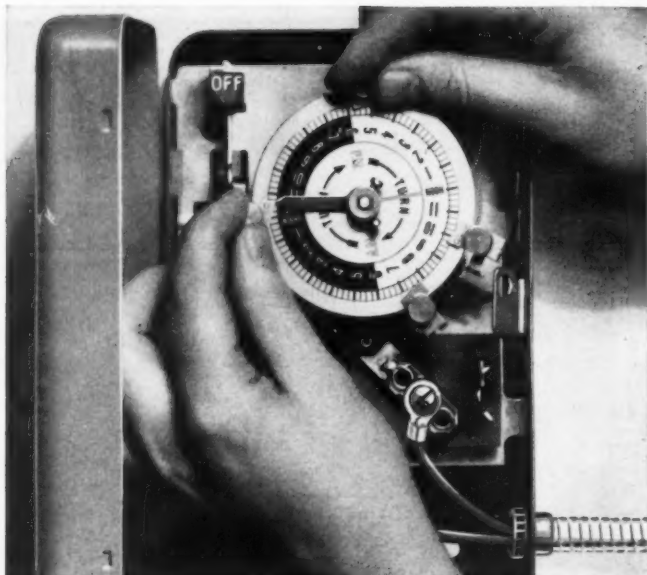
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GENERAL  ELECTRIC
603-118

Lamp Makers Meet With NPA

During a recent meeting of the Incandescent and Fluorescent Lamp Manufacturers Industry Advisory Committee with the National Production Authority officials in Washington, the Committee recommended discontinuance of the dollar authorized production schedules under which they currently operate, beginning as of July 1st.

The production schedules which have been used since the beginning of the 4th quarter 1951, have served as a supplementary means of guaranteeing manufacturers an equitable distribution of controlled materials in the way of finished lamp components.

The value of 1951 shipments of incandescent and fluorescent lamp bulbs was reported to be \$280-million. Thus far in 1952 the industry has received sufficient allotments to allow it to maintain a similar rate of shipments compared with 1951, when combined with the use of inventories and the exercising of economy and making of certain materials substitutions.

NPA advised the lamp makers that, barring unforeseen contingencies, the metals supply situation in the 3rd and 4th quarter of this year should be somewhat improved. The supply of tungsten and molybdenum is eased in comparison with conditions a year ago. Increased rolling facilities may allow an increase in the output of aluminum, and a slight increase in copper production by the end of the year can be forecast, NPA said. The nickel supply situation, on the other hand, is not improving to any great degree, although nickel anodes are in slightly better supply.

NPA officials urged, however, that manufacturers of lamp bulbs continue



ELECTRIC SERVICE locations in homes are discussed by: (L to R) Minnesota state electrical inspectors J. C. Franklin and Stan Sayre of St. Paul and W. E. Booth, Bright Light Electric Co., St. Paul. Place: All-industry electrical conference at St. Paul.

all types of conservation and stressed the importance of their returning unused allotments of controlled materials as soon as possible each quarter.

The committee reported considerable progress in converting to aluminum from brass in certain types of lamp bases. At present, nevertheless, the lamp makers still use more brass than aluminum in manufacturing these bases.

Nine committee members attended the meeting, which was presided over by Lester W. Dettman, of NPA's consumers durable goods division.

Distributors Need More Copper Wire

A basic change in the controlled materials plan for copper wire mill products was recommended to NPA recently by the Electrical Apparatus and Supply Distributors Industry Advisory Committee. This change is needed, Committee members said, because they are now selling themselves out of business under CMP provisions for inventory replenishment.

Committee members reported that inventory replenishment of wire and cable delivered to customers in October, 1951 (a provision clause in NPA order M-86, the copper wire mill products distributors order) still is far short of the amount they are authorized to receive, and that replacement of current deliveries is unsatisfactory. They recommended that Order M-86 be revoked, and that producers be permitted to set aside a percentage of their production for delivery on military orders and distribute the remainder equitably on unrated orders to established accounts.

Another committee recommendation would authorize copper wire and cable distributors to use allotment symbol X-6 (M-86 symbol) to purchase surplus stocks of non-standard items.

The committee recommended "R" type wire be discontinued altogether, and that aluminum conductor production be confined to items that would not require redesign of circuit fittings. Copper wire for machine tools could be standardized with an appreciable conservation of materials, they said. They expressed concern that new users of copper wire and cable, and expanded operations by established users may represent an additional demand on the already critical supply.

NPA advised that an amendment to Order M-86 will be issued soon which will provide high band priority status for replacement of inventory delivered on Military Z-2 and B-5 orders.

The committee was advised that a

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Built up to definite standards for excellence of service, QUAD Reflectors fully meet user approval.

GLASSTEEL DIFFUSER THREADED HOOD: The principal feature of this line is a rolled thread of heavy gauge copper connecting the porcelain enameled reflector to three types of socket hoods—pendant, outlet box and horizontal. The Diffuser delivers a certain per cent of light toward the ceiling eliminating unpleasant light contrasts in the room.

QUAD SOCKET REFLECTORS: 5 styles made in various sizes for general industrial illumination. Solid neck construction eliminates all exposed joints and seams. Each has a weatherproof top fitting and is available with shock absorbing sockets as well as the standard rigid socket.

QUAD SHADE HOLDER REFLECTORS: 5 styles made in various sizes. The Standard 2½" fitter adapts them for use with any screw or other type shade holder.

HEAVY THREADED REFLECTORS AND SOCKET HOODS: Especially serviceable for railroad yards and industrial locations where atmospheric conditions require sturdy lighting equipment that can be easily removed for cleaning. Made in 4 reflector styles.

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The P & R Type W Winding Stand has an almost unlimited capacity. Designed for peak performance with loop, heavy duty group and single phase winding heads, it can also be used for small transformers and field coils. With tail-stock attachments and face plate, the Type W Stand is adaptable for large transformer rewinding. Banding tension unit also available.

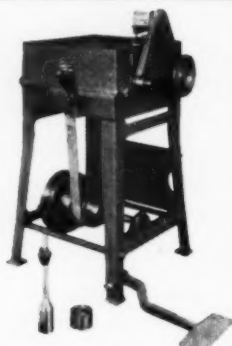
Easy to operate, friction-free long life assured by self-aligning ball bearings. Spiral steel gears provide smooth operation. Easy to read reversing reset counter.

Powerful, four plate, multiple disc clutch provides positive control, smooth starting. Heavy duty, cone type brake. Two power shafts. Rear spindle for loop, group or transformer winding. Five speeds from 16 to 173 RPM, optional gear ratios from 30 to 314 or 34 to 360. Front spindle for single phase or field coil winding and reeling wire. Three speeds from 250 to 810 RPM.



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MAINTAINING A BALANCED STOCK of electrical parts to meet contract requirements in a hurry is practically impossible in these days of shortages, says J. B. Shamel, President of California Electric Construction Co., Los Angeles (left), as he reviews this problem with his chief engineer Bob Ryan.

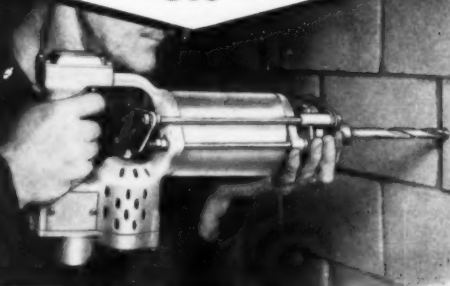
small quantity of aluminum has been earmarked for production of wire and cable for delivery against certifications under the construction regulations. NPA told the members that No. 12 is the smallest size contemplated for production of aluminum insulated or covered conductor.

NPA also told the committee of a proposal to modify rating authority for CMP Class B products. The proposal would amend direction 3 to NPA Regulation 2, and add a large number of B products to the exclusion list—but the products would not be subject to any priority rating except A through E (Military and AEC) and Z-2 (machine tool production). Members endorsed the proposed amendment, and reported satisfaction with order M-17—Electrical Conduit, which permits manufacturers to ship 25% of their total production on unrated orders.

G. E. Wins Three Home Safety Awards

The General Electric Co. was awarded the Grand Prize at the Seventh Annual Home Safety Awards Dinner at Lewis and Conger at the Waldorf-Astoria on April 21, for an improved method for the wiring of its electric automatic blanket. Replacing the former lumpy thermostats scattered through the blanket, the new system depends on a nylon-sheathed wire to react instantly to any overheating by relaying a shut-off signal to the control box. Ralph J. Cordiner, president of G. E., accepted the bronze plaque and also the award for a new "All Purpose" fan, with its safer design and protective grille.

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A. F. Warren, general manager of the Monowatt Division of General Electric, Providence, R. I., accepted the award for its Twin Night Lights, offering a combination of bright and dim lights for all-night protection in various danger-spots about the house.

Other winners of Safety Awards were Casco Products Corporation of Bridgeport, Conn., for the new "M-T Spout" feature of the Casco Steam and Dry Iron; Sawhill Manufacturing Company of Sharon, Pa., for its improved roller-bearing Red-I-Post, an adjustable pole to hold up sagging floors; Weaver Sales Company of Salt Lake City, Utah, for its E-Z Lift Pot and Jar Holder; and Peerless Mfg. & Distribution Co., Inc. of Sheridan, Wyoming, for its Christmas Tree Stand, designed to prevent fires by keeping the tree constantly moist.

A special Award was made to the American Mutual Liability Insurance Company of Boston, Mass., for its effort to awaken the public to the vital importance of home safety precautions. The campaign has been conducted on a nation-wide scale under the name of "The Institute for Safer Living".

Specialty Transformer Volume Down

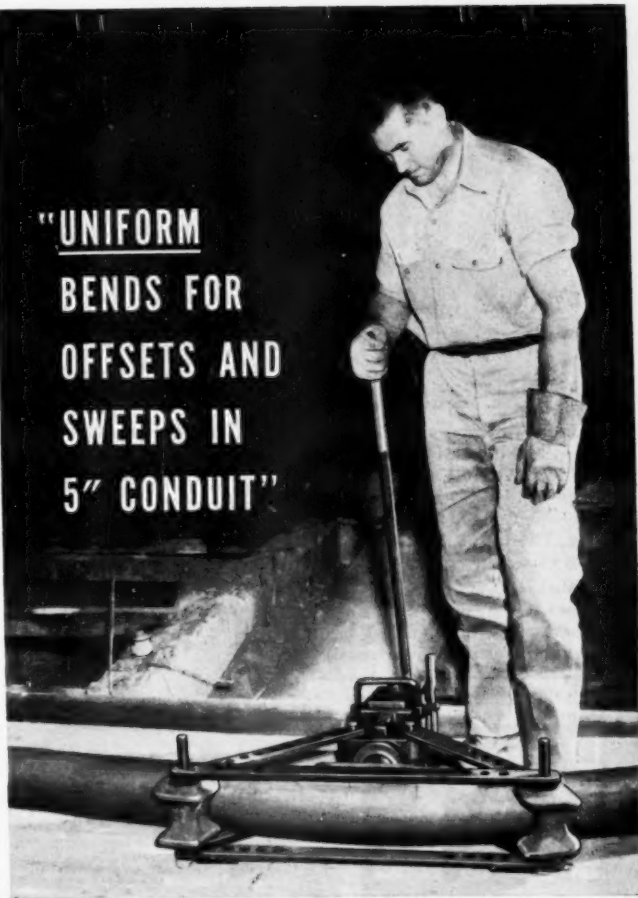
A decline of orders for specialty transformers and fluorescent lamp ballasts has slowed down present production of these items to the point where some plants are operating at from 70 to 75 percent of capacity. This situation was reported to the National Production Authority recently when the Specialty Transformer and Fluorescent Lamp Ballast Industry Advisory Committees met jointly with NPA in Washington.

This reduced volume of business has considerably eased the pressure on NPA for materials allotments in the first half of 1952. However, increased production is anticipated in the last half of the year, which is normal seasonal high for the industry.

Basing its estimates for lighting equipment on new building construction, the Fluorescent Lamp Ballast committee said its requirements for 1952 should approximate those of 1951 but 1953 requirements may be almost 10% higher.

The Specialty Transformer committee, less optimistic in its production forecast, anticipated a possible upward trend toward the latter half of the year. To meet industry requirements, it recommended: 1) that normal lead time of six to nine months be recognized for the manufacture of special

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SWEEPS IN
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saves time, cuts costs for O. V. Scott Electric**

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and practical use," says Mr. Scott. You, too, can save time and labor with a GREENLEE Bender on your jobs. With it one man quickly makes smooth, precise bends in pipe up to 5", rigid and thin-wall conduit, tubing, bus-bars. Often pays for itself on first job. Write for facts today. Greenlee Tool Co., 1745 Columbia Avenue, Rockford, Illinois.



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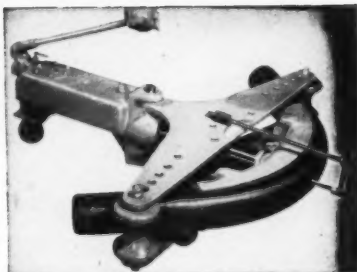
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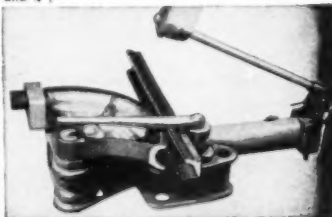
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furnace transformers; and 2) that the problem of standardization of furnace transformers be studied further.

NPA said manufacturers may soon expect additional military orders on electronic spare parts, including specialty transformers, and reminded committee members that small firms are being given defense contracts where feasible.

Industry members gave the following report on materials: Magnet wire—shortages exist in large, square and rectangular sizes but supplies are ample for fine, round sizes; steel—in plentiful supply with the exception of grain-oriented core steel; aluminum—no shortage apparent, although greater use of aluminum as a substitute for copper magnet wire would mean an increased demand. This could be met, according to NPA, by the continued increase planned in allotments of aluminum.

A committee member asked that a specific soldering flux for aluminum, now prohibited from use because of its high cadmium content, be made available to the industry. NPA promised to review the request and also offered to consider increased aluminum allotments wherever aluminum is used as a copper substitute.

Committee members who attended this IAC meeting were: W. E. Wilson, Acme Electric Corp., Cuba, N. Y.; Hirsch Epstein, Advance Transformer Co., Inc., Chicago; John C. Hindle, Etraco Mfg. Co., Flemington, N. J.; J. H. Mayne, The France Mfg. Co., Cleveland; D. G. Taylor, Gardner Electric Co., Emeryville, Calif.; P. M. Staehle, General Electric Co., Fort Wayne, Ind.; J. M. Bennan, Jefferson Electric Co., Bellwood, Ill.; R. O. Hurst, Westinghouse Electric Corp., Sharon, Pa.; W. R. Sorgel, Sorgel Electric Co., Milwaukee; T. Logie, Stratfield Co., Bridgeport, Conn.; and E. C. Huerkamp, Westinghouse Electric Corp., Cleveland.

M. E. Robertson, of NPA's Electrical Equipment Division, presided.

Correction

In the April 1952 issue of Electrical Construction and Maintenance, page 186, credit for the development of a flexible metal hose used on the Empire State Building's TV antenna system was inadvertently given to the wrong company. The new, heavy duty, flexible metal hose used in this application was developed by the Atlantic Metal Hose Company, Inc.

Installation was made by B. Eichwald & Co., Inc., Electrical Contractors, New York, N. Y.



THE MAGIC of electronics is explained in layman's parlance to Iowa Electrical Association conferees by Gordon Volkenant of Minneapolis, Minn. Meeting was held at Ames.

Agricultural Outlook

The present outlook for agriculture is much more stable than for other parts of the U. S. economy, according to the McGraw-Hill Department of Economics. Although 1952 promises a good many ups and downs for the various segments of manufacturing, farm prices and farm income are likely to average very close to 1951 figures.

Stability in agriculture keeps industry in two ways:

1. Stable food prices mean the cost of living can't rise much. And this holds down wages in industries where they are tied to living costs. In other cases, new wage demands will be stimulated by the success of the steelworkers' union. But the drive isn't likely to gather as much steam as it would if food prices were going up.

2. Stable farm income means a good market for the many industrial products sold to farmers. In 1951, farmers invested close to \$6 billion in new construction and equipment. (Over \$4 billion for machinery and vehicles; about \$1.5 billion for new construction.) They also spent about \$13 billion on consumer goods, much of it for durable items. Agriculture is the largest single market for chemicals (over 20% of total sales), and one of the largest markets for textiles, cars and trucks, and certain building materials.

For all these industries, the 1952 farm market should be at least as good as 1951.

In recent months, farmers have had their share of jitters about the outlook. Farm prices dropped 5% from December to March. They're 7% below



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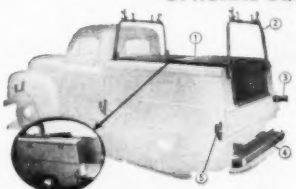
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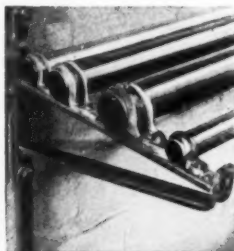
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a year ago. Some people have taken this as the beginning of an agricultural recession.

Actually, it's just that farmers and food processors—like everyone else—have been nervous about holding inventory. More livestock and more feed grains than usual were thrown on the market this winter. So seasonal price weakness has lasted longer than expected.

But the basic demand for farm products—both here and abroad—is still quite strong in relation to available supplies. You can look for farm prices to show some recovery in the months ahead. The Department of Agriculture figures will average out for the year about as high as in 1951.

With good weather, the volume of farm products marketed will be up about 5% this year. So farmers' cash income will reach a new high—about \$39 billion. But production expenses will also be higher. Net farm income will be about the same as in 1951—\$15 billion.

Farmers will also have about \$5 billion of income from investments and other non-farm sources, making total income of \$20 billion. After taxes, farm families will have about as much left to spend on consumer goods or invest in new buildings and equipment as they did last year. And that means a pretty strong market.

Looking Ahead

It's easy to point out risks in the farm situation if we hit a period when the demand for farm products isn't so strong. Some inventories are still high, particularly livestock inventories. And farmers have borrowed pretty heavily to finance this build-up. Costs are way up. And agriculture, more than industry, is vulnerable to swift and sudden price declines.

If general business turns wobbly late in 1952 or early in 1953 and consumer buying power drops, farm prices and farm incomes will be hit fairly hard. Farm prices dropped over 20% in the 1949 recession. And agricultural forecasters expect at least a 10% drop in any future shakeout. For a time, that could have severe effects on net farm income and on expenditures for farm modernization.

But farmers are in better shape than ever before to come through such a readjustment. Real estate debt is lower than prewar, although the value of farm real estate has doubled. And farmers' cash holdings are near an all-time high. Total farm debts are more than covered by farmers' holdings of currency and bank deposits—a ratio any industrial concern would be proud of.

It's important also to remember that if farm prices drop very much, and in-



FRIENDLY COMPETITORS in Sacred Heart, Minn., are electrical contractors Marvin Skalbeck (left) and his former employer E. E. Soderquist. Both feel that a majority of farms need rewiring from the standpoint of safety and adequacy.

come from marketing declines, the government will step in with price support payments. The law requires sufficient payments to maintain farm income at a relatively high level. Congress has never voted enough money to support all prices—the cost would be astronomical. But the government might pay out as much as \$3 billion in a recession year. And that would make up a good part of the drop in farm income.

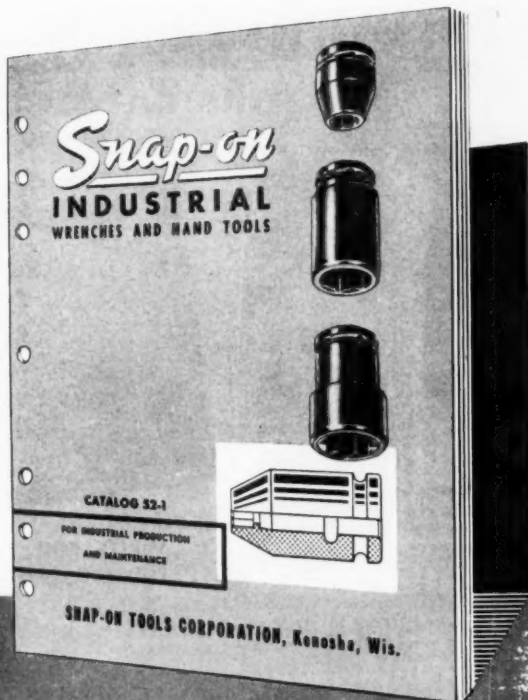
For example, if prices and cash income fell 20% from the 1952 level, the drop would be almost \$8 billion. But \$3 billion of support payments would make up almost half the loss. And since farmers' expenses would also decline, net income might not be off more than 10%.

If income declines can be limited in this way, farmers' strong financial position may enable them to keep spending fairly large amounts to modernize their equipment and homes, even in a business recession.

The Agricultural Revolution

Another source of strength in the farm market is the long-term trend toward the mechanized farm. Agriculture in the United States has been mechanizing at a rate that can only be described by the word "revolution." The chart shows the rise in farm use of tractors, electric power and fertilizer (which is a rough index for the use of chemistry on farms). And the curves tell their own story.

There's every reason to believe that over the next 10 to 20 years this trend to mechanize and modernize will continue, and even accelerate. *Electrical World* estimates, for example, that by 1955 the use of electricity in farm production (not counting farm homes) will increase 60% over 1950. Many



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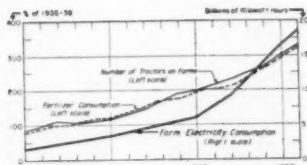


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THE FARM REVOLUTION



new machines—cotton pickers and sugar beet harvesters, for example—are still only in limited use. Chemical consumption on farms is expected to increase at least a third in the next decade.

There are three basic reasons behind this drive. And they will all increase in urgency as time passes:

1. Both population and per capita consumption of food are growing. By 1975, there will be five plates to fill for every four now.

2. Farmers can't meet this need by using more land or labor. All the best land is under cultivation now. And in many areas farm labor is increasingly short, as young men go off to higher paying jobs in factories. The only answer is more chemicals to improve the yield from existing land, more machines.

3. Small subsistence farms are being consolidated into bigger farms. The subsistence farmers are going to work in towns. And new capital is coming into farming from people who want to run farms as large-scale businesses. This only pays off if the farms are highly mechanized.

For these reasons, agriculture promises to be a growing market for industrial products over the long pull. It also promises to hold up somewhat better than other markets for durable goods in any decline which may take place during the next year or two.

**CPR-93 Amendment
Under Study**

The Construction Industry Advisory Committee to the Office of Price Stabilization met with OPS on April 25 to make recommendations for the consideration of the Pricing Agency in the drafting of a proposed amendment to the regulation covering the industry, Ceiling Price Regulation 93.

The agency had proposed, tentatively, that CPR-93 covering construction and related services and sales of installed materials, be amended to restrict the coverage of the regulation with respect to manufacturers' sales on an installed basis; to provide a pricing method and reporting requirements for sales of construction services

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ORLIN FOLWICK, public relations director, Minnesota Federation of Labor (A.F. of L.) addresses the 20th Annual Meeting of the Midwest Electrical Council at St. Paul, on the subject of cooperation between employers and employees.

on a "flat price" basis; to provide for a reference to a catalogue, price guide, or pricing service in lieu of separate listing of materials.

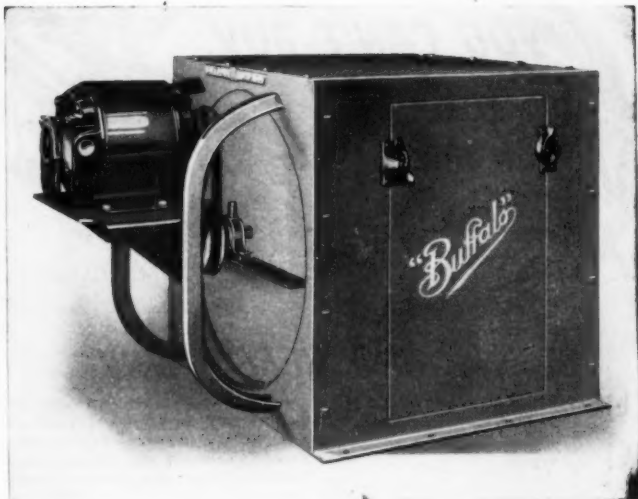
Members of the committee reported their industry was in a depressed state and that it was offering services below present ceilings. They recommended decontrol as the only method for them to benefit, saying that with decontrol they would not have reports and records to maintain which, they said, had proven costly.

The agency-proposed "flat price" was described to committeemen. The agency said it was generally offered or advertised fixed prices for the sale of a specific construction service or unit of service. The agency said also, it had learned some sections of the country were using the method. It differs, it was stated, from a unit price quoted in a lump-sum bid in that it is not separately formulated for each sale.

Committeemen expressed the opinion the line between the two was too finely drawn to be effective.

Committeemen present were: John N. Steadham, Central Florida Tile and Marble Co., Gainesville, Fla.; D. C. Lingenfelter, Home Modernizers, Inc., West Roselle Park, N. J.; Rodney M. Lockwood, Detroit, Mich.; V. J. Killian, V. J. Killian Co., Winnetka, Ill.; W. A. Widemann, W. A. Widemann & Son, Kansas City, Mo.; and F. W. Heldenfels, Jr., Heldenfels Bros., Corpus Christi, Texas. Ten other committee members were unable to attend.

The meeting was conducted by Walter H. Acheson, Chief, Building Materials Branch, of OPS' Industrial Materials and Manufactured Goods Division and Arthur E. Reyman, branch counsel.



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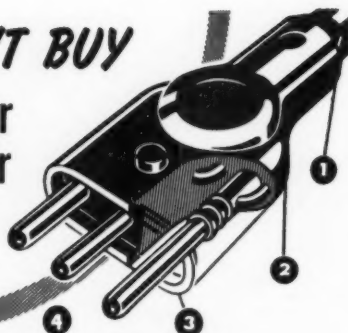
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Fleischmann Tells Science Group of our Metals Needs

Speaking before the American Academy of Political and Social Science in Philadelphia, on April 18th, Defense Production Administrator Manly Fleischmann pointed out that of 38 important industrial minerals the United States is sufficient in only 9, and declared that:

"We are, in the main, dependent today as we were in 1945 on the uninterrupted importation of columbium, nickel, cobalt, and tungsten for the support of our jet aircraft program, to cite but a single example."

In his speech, Mr. Fleischmann recognized that there had been some criticism of the International Materials Conference, but stressed the fact that IMC "has not impaired the normal commercial operations of importers and exporters in the various countries in any manner."

Mr. Fleischmann stated: "No agreements have been made or are contemplated requiring this nation, or any other nation, to take over exclusive purchasing functions with respect to the materials allocated pursuant to IMC recommendations. . . ."

"So long as private enterprise can do the job, it is my firm conviction that this should be, and I believe will be, this nation's preferred and primary reliance in the field of international trade."

"But there is no blinking the fact that when ordinary commercial methods prove inadequate to insure and protect our supply of these survival necessities, the Government must assume the responsibility of making up the deficit."

He made clear his opinion that the IMC is by its very nature an emergency operation and its existence will surely come to an end when the emergency ends.

"We must face the unpalatable fact that America today is a 'have not' nation with respect to the majority of the metals indispensable to the attainment of military strength and, consequently, indispensable to national survival," Mr. Fleischmann said. "This is a crisis of many years of tension—now heightened, now lessened."

Noting "appeasement and peace talk as a new note in the Soviet Symphony," he said "a wise national policy will surely disregard such siren songs, and will continue resolutely on the path of completing and maintaining an effective military establishment in the years ahead, until an international settlement of a permanent nature can be reached."



FARM WIRING CODE is the subject of this huddle between: (L to R) John M. Turner, Canton Electric Co., Canton, Minn.; Art Eckholm, state electrical inspector, Preston, Minn.; and contractor H. C. Johanneck, Redwood Falls, Minn.

NISA News

New England Chapter held meeting at the Hotel Bradford on March 13. The meeting was called to order by President Whittemore. The minutes of the previous meeting were read by Secretary Edwin Kolhonen, and approved. Also a report on Foremen's Meeting. Mr. Whittemore again reminded the officers of reports for the next meeting and election of officers.

A buy and sell session was conducted and the president called on Dave Halliday vice president of the Baldor Electric Co. for a few brief remarks. The president then called on program chairman Harry Redig and he in turn called on Paul Leicht, A. Elson and Paul Keating who each gave a very comprehensive and important description of methods for handling paper work associated with receiving, processing through the shop and billing repair work. The numerous discussions and the examination of the printed cards and forms after the close of the meeting indicated a wide spread interest in this subject.

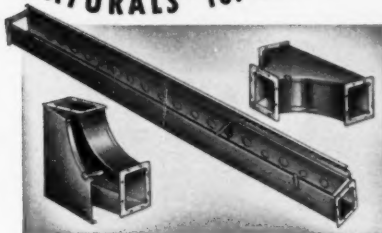
A proposal to amend the by-laws was presented to the members which had already been approved by the directors. The proposal is to amend Section 1, Article I by striking out the words 164 Oliver St., Boston 10, Mass, and inserting in their place, 250 Broadway, Boston 11, Mass, so that it reads:

"The name of this association shall be The New England Chapter of the National Industrial Service Association, Inc. The location of its administrative office shall be 250 Broadway, Boston 11, Mass."

The first quarterly meeting of the Mid-South Chapter of NISA was held at the Noel Hotel, Nashville, Tennessee, on March 8, with 56 members and guests in attendance.

By special bus a visit to the Tennes-

"NATURALS" for any wiring job!



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Interchangeable
WIREWAYS and
AUXILIARY
FITTINGS!

Yes, there's extra profits for you . . . greater customer satisfaction, too . . . on every wiring installation made with KEYSTONE Interchangeable WireWays and auxiliary fittings. For the KEYSTONE line is the QUALITY line that gives you the basic flexibility of arrangement required to fit naturally into any electrical distribution layout. Provides permanent protection for main power lines . . . for feeders, branch circuits, control and signal wiring systems. Quickly, easily, neatly installed . . . saves time and labor as compared with piping and other

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KEYSTONE WireWays are available in Flanged or Flangeless types . . . with or without knockouts . . . in sizes of 2 1/2" x 2 1/2", 4" x 4", 4" x 6", and 6" x 6", and in foot lengths of 1' through 5' inclusive. Matching elbows, T fittings, hangers, brackets, collars, closing plates, and reducing bushings also available. Write for new "value-packed" catalog today!

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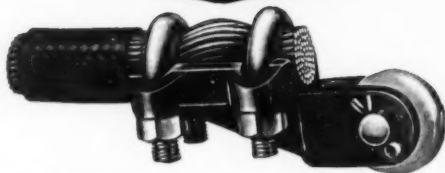


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MANUFACTURERS OF EFFICIENCY
ELECTRICAL DEVICES FOR CONDUIT,
WIRE AND CABLE SUSPENSION

"EFFICIENCY" DEVICES FOR CONDUIT and CABLE SUSPENSION

see State Penitentiary was made. Returning to the hotel, luncheon was served at 12:30.

H. E. Grant introduced guests and new members attending the chapter meeting for the first time. He also introduced Russell Green of Nashville, Tennessee, and Selden High as speakers. Russell Green of the Wage Stabilization Board, Nashville office, explained in detail what could and could not be done under WSB regulations. Selden High from Cincinnati, Ohio, gave us a very interesting talk on "Old Man Overhead", after which H. E. Grant turned the meeting over to President Howard.

President Howard presided at the business session.

Tom Russell, National Director and Chairman of the National Award Committee, requested entries in the contest.

Fred Wiperman, National Executive Secretary, spoke at length on the National NISA efforts to help the members and how the members could help themselves.

Tom Russell's invitation to hold the next meeting in Mobile and/or environs was accepted. This meeting is to be held in June.

As reported by secretary Harry M. Kollus, the Northwest-Central Ohio Chapter of the NISA was held at the Harding Hotel, Marion Ohio on March 22, at 12:30. Approximately 35 attended.

Opening remarks were made by At-



FOREMEN Don Story, Louis Campana and John Burrows check a drawing detail on the electrical installation at Pittsburgh's new airport, now nearing completion, where they supervised electrical work in the Terminal Building for the Howard P. Foley Co., one of five Pittsburgh electrical contractors who worked on this project.



MACHINE TOOL WIRING huddle, at recent Chicago Electrical Maintenance Engineers meeting, finds C. G. Dimitt (left) supervisor of design engineering, U. S. Steel South Works, Chicago; and L. F. Giegel, Reliance Electric & Engineering Co., branch manager at Gary, Indiana, discussing J.I.C. electrical standards.

torney Charles E. Drury from Van Wert, who entertained with stories of Northwestern Ohio History. His stories were interesting, educational and he told tales of this territory unknown to modern day historians.

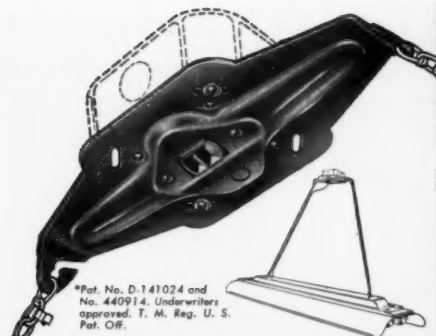
Dwight W. Hostetter of the Central Trust Company, Cincinnati, Ohio spoke on the estate plan, what it is and how it affects everyone. He also spoke on the importance of a Marital Trust Fund in saving taxes. A. P. Barringer of the Prudential Insurance Company spoke on agreement in business between partners and on sole ownership with regards to disposal of the business in case of death. He advised planning the business in Trust and brought before the meeting the value of co-insurance.

Ed Potter spoke on impossibility of holding meetings monthly and suggested quarterly meetings.

Motion was made by Mr. Bonham to institute movement by NISA to have NEMA recommend to manufacturers that they place identification cards on the outside of crates to properly identify motor type, etc. Seconded by Clyde Pierson.

The Southwestern Chapter met at Beaumont on March 14-15 with 38 men present, representing 33 firms, including suppliers. While the ladies were very graciously entertained, the men heard presentations on CPR 93 by E. N. Reichart of OPS, and on wage stabilization by J. R. Peck, an attorney, who emphasized the need of compliance with WSB and other governmental regulations. A. Phillips of Allis-Chalmers Houston office, spoke on "Trends in the Electric Motor Field."

At the business session on Saturday



*Pat. No. D.141024 and No. 440914. Underwriters approved. T. M. Reg. U. S. Pat. Off.

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IN LESS TIME... AT LESS COST... WITH LESS WORK

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3. Hang the fixture and plug it in. That's all! Self-grounding—regular 2-wire cord and plug may be used.

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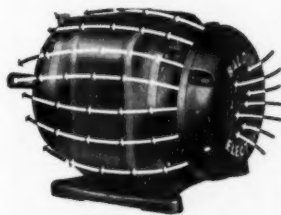
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- FITS ANY HEAVY DUTY 1/2" or 3/4" DRILL...as easy as changing bits! Overall length only 10 3/4"; weight only 3 lbs. 6 ozs.
- ANTI-FRICTION REPLACEABLE BEARINGS—BUILT-IN BLOWER... Blower keeps tool comfortably cool even under continuous use—blows dust and chips away from cutting line. All friction surfaces are of "Oilite," phosphor bronze or high speed ball bearings. All wearing parts are replaceable.

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extensive changes were made in the by-laws, with the adoption of a small, flat annual dues schedule. Officers for the coming year to begin September 19 were elected: President, Carl Pons, Carl Pons Electrical Co., Shreveport, La.; Vice President, J. C. Hardie, Hardie Indus. Elec. Equip., Dallas, Texas; Secretary, Geo. Foshee, Foshee Electric Co., Fort Worth, Texas; and Treasurer, Geo. T. Kinard, Kinard Elec. Mach. & Rep., Beaumont, Texas.

A shop inspection trip was made to Kinard's shop (recently enlarged) and the new plant of the J & J Armature Works, which had been formally opened only a week before.

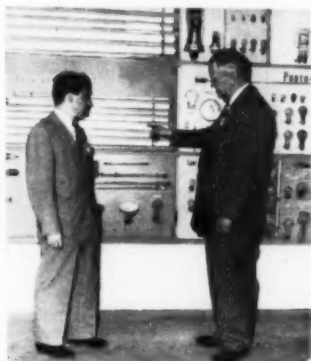
Before dancing began Saturday evening, the banquet was addressed by Randolph C. Reed who stressed the need of fuller living and neighborliness.

One of the high spots of the meeting for President Zack and for Wippermans was the official reception that had been arranged, including a police escort to the hotel. When President Zack retires from his present office he will continue as an official of Jefferson County, Texas.

W. S. Giles, Giles Electric and Armature Works, Marion, Illinois, was a recent visitor at Headquarters.

The Fagan Electric Company of Little Rock, recently held a two-day open house to celebrate their 38th anniversary.

Quaker City Chapter meeting was held on March 12 at Beck's on the Boulevard, in Philadelphia. Jos. B.



INSPECTING a panel of lamps at the General Electric Lighting Institute, Nela Park, is John J. McLaughlin, contracts manager of the Kelso-Burnett Electric Co. of Chicago (left), with Walter Becky of G. E.'s sales staff. McLaughlin, a member of the National Electrical Contractors Association, was principal speaker at a lighting conference G. E. conducted for electrical contractors early in April, and Becky served as program chairman.



CHECKING A SET of plans on a construction project are: (L to R) R. F. Heysinger and R. E. Anderson, engineers and estimators in the construction department of the Davenport Electric Contract Company, Davenport, Iowa.

Wagner, presided. Roll call showed 30 present. Minutes of preceding meeting were read by Secretary F. Schaefer and approved as read.

In the absence of the treasurer, his report as to the financial condition of the Chapter was read by the secretary.

At this point, the presiding officer relinquished the chair and the meeting was then turned over to the direction of Bill Engel, Vice President.

Entertainment committee brought up the subject of the June social meeting, and it was agreed that LuLu Temple Country Club would be most suitable place to hold it, with preference for a Friday evening.

Under new business, Mr. Davies took the floor and explained a change he thought could be readily made by the manufacturers of motors in the numbering of leads on two and three phase, that would permit repair shops to trade the dual voltage hookups more easily.

There being no further business, the floor was turned over to the representatives of Reliance Elec. and Engr. Co. who delivered very instructive talks on VS drive.

• • • • •
New York Metropolitan Chapter on the day of the regular meeting, March 20, entertained its members by a trip to Eutectic Welding Alloys Corp. in Flushing, New York. This corporation, engaged in manufacturing of welding rods and other welding materials, arranged a demonstration to 38 members of the group from 24 companies.

The regular meeting which followed was devoted to a discussion of plans for the forthcoming 1953 convention in Chicago and election of officers for the coming year.

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The RELIANCE Model "400" time switch offers features usually found only in higher-priced switches. The precision gear train is driven by a standard, heavy-duty motor, with gears oil-sealed for lifetime operation. Pit-resistant silver-to-silver contacts, and entire mechanism are housed in a one-piece deep-drawn steel case.

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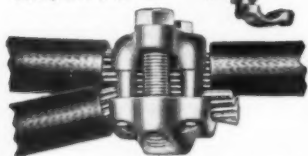
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THE ROLE of the consulting engineer in the electrical construction industry is explained to Minnesota contractors at St. Paul meeting by W. D. Schoell, representing the Minnesota Association of Consulting Engineers.

Those elected were: Alex Shovan—President, George Lookwood—Vice President, H. W. Engelman—Treasurer and L. D. Kennedy—Secretary, Board of Directors A. Bonahur, W. Kaupert, W. Lierer, Stanley Bojak, Wm. J. Wheeler and J. Ryan.

From Walter J. Price, The Maintenance Company, Inc., New York City.

Research Grants By Wakefield

A research fund of \$10,000 has been established at the Massachusetts Institute of Technology, and a student fellowship of \$2,650 has been granted to Case Institute of Technology by the F. W. Wakefield Brass Company, Vermilion, Ohio.

The MIT fund is to the School of Architecture for study of all environmental factors contributing to the process of seeing; to provide a center for investigating the effects of various distributions of light, heat, sound, air movement and other energy factors upon task performance, and methods and equipment for controls of these factors; and to collate researches in physiology, ophthalmology, and optometries, and other fields which have bearing upon seeing.

The Case fellowship is for research in thermal environment and the production of a thesis covering certain phases of air-conditioning and radiation.

A. F. Wakefield, president of the F. W. Wakefield Brass Co., manufacturers of lighting equipment, states that these grants and "The Coordinated Classroom" Foundation at Stanford University, to which Wakefield and certain other makers of school

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NON-RENEWABLE****5**
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Engineering improvements in the design and construction of ROYAL-NOARK cartridge fuses mean that they stay cooler... give greater protection to vital equipment...

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equipment contribute, stem from an interest in all factors which in combination produce good seeing conditions; and from the desire to further the conclusions reached at Case in 1951 regarding advantages of a totally-luminous suspended ceiling as an architectural unit which furnishes controlled light, air diffusion, and noise reduction in the area covered.

Book Reviews**Motor Winding Data**

The second edition of the book on "Three Phase Motor Winding Data From Simple Measurements" has recently been announced. Based on the original simple method of using measurements in inches for various parts of a motor—bore, below-slot-iron, length of stacked lamination—and of counting the number of slots, it presents 21 nomographs (charts) in which these data can be applied to quickly determine the number of turns required for various motor ratings for a number of poles and speeds.

The charts in this edition have been improved since the first edition was published eight years ago by checking over 8,000 stators. The number of charts have also been increased to include a larger number of slots, and to permit checking for lower speeds.

The determination of turns for single phase motors has been added to the text, as well as other material pertinent to the changeover and pitfalls of finding winding data.

This book is not intended to replace a design engineers handbook, the author states, but to provide a method for quickly checking a winding with considerable accuracy, or to redesign an existing winding. Use of the charts will prove them to be excellent time and labor saving devices for this purpose. The author has also compiled a list of basic books for motor shop use, which is included as part of the text. A transparent plastic rule is furnished with the book to serve as a straight edge in applying data to the charts.

The author is Sam Heller, who has been in the motor repair business for more than 17 years, and is in charge of one of the largest motor rewinding shops in the East. He has tested the charts daily in his shop over a period of years to check every winding regardless of whether it was original or not.

The book contains 43 pages, is 9½-inches by 12½ inches in size, and is published by The Datarule Publishing Company, 12 Oakway, Scarsdale, N. Y. Price is \$25.00.

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for dependable
wiring devices

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Sound engineering, quality materials, and experienced manufacturing skill make ROYAL wiring devices better for you those three ways: 1) they're easy to wire; 2) always dependable; and 3) long life under constant use.

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ELECTRICIAN'S ELECTRICAL CONTRACTORS CASH IN on this No. 1 FIRE ALARM "FIRE SENTRY"



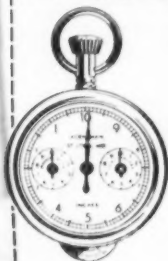
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. . . Architects and Engineers too prevent all chance of error in calculations with Rotameter. Simple to use—just run roller over line from right to left. Measures curved and irregular lines and totalizes number of straight lines too. Press stem to return hands to zero. Descriptive circular gives more details—send for it.

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Among the Manufacturers

Headquarters Announcements

National Electric Products Corp., Pittsburgh, Pa.—Vincent P. Oatis, Jr., industrial sales manager for wiring ducts, connectors, terminal blocks and junction boxes.

Westinghouse Electric Corp., Sharon, Pa.—R. N. McCollom, manager of the Application Engineering Dept. of the Transformer Division; J. L. Cross, manager of the power equipment group; R. D. Rung, manager of the distribution equipment group.

Minneapolis-Honeywell Regulator Co., Brown Instruments Div., Philadelphia, Pa.—William H. Steinkamp, sales manager of the industrial division.

Barber-Colman Company, Rockford, Ill.—acquires the principal assets of Wheelco Instruments Company, Chicago, Ill.

General Electric Company, Schenectady, N. Y.—Robert W. Kise, manager of products planning for the industrial heating department.

RCA Victor Division, RCA, Camden, N. J.—Thomas H. Ford, engineering manager of room air conditioning activities.

Inet, Inc., Los Angeles, Calif.—J. C. Washington, manager of sales of direct current power supplies and controls.

General Electric Company, Morrisson, Ill.—Phillip Gomez, Jr., manager of sales for the new appliance control department.

Owens-Corning Fiberglas Corp., New York, N. Y.—Fowler Blauvelt, manager of wire and cable sales for the textile products division; Jacob Wallace Coleman, Jr., manager of apparatus insulation sales for the textile products division.

John A. Roebling's Sons Company, Trenton, N. J.—has recently opened a new district office and warehouse in a new, ultra-modern building in Los Angeles, Calif.

General Electric Company, Cleveland, Ohio—Henry J. Channon, manager of original installation sales for the lamp division; James C. Forbes, manager of the Lighting Institute, Nela Park.

The Okonite Company, Passaic, N. J.—E. D. Youmans, vice president, elected to Board of Directors.

Bulldog Electric Products Company, Detroit, Mich.—has expanded its manufacturing facilities in Detroit with the

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them by name...

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MANSON tapes**



REMINISCING about days gone by are two electrical industry pioneers honored by the North Central Electrical Industries at recent St. Paul convention. Electrical engineer H. L. Wherland, Minneapolis, congratulates contractor P. E. Sievert, (right), Hastings, Minn., who received certificate commemorating 51 years in the business.

acquisition of a two-story building of 53,000 square feet.

G & W Electric Specialty Co., Chicago, Ill.—Pearson F. Williams, chairman of the board and president; Andrew E. Papp, executive vice-president and general manager; C. W. Sward, vice-president in charge of sales.

General Electric Company, Bloomfield, N. J.—W. L. Sneltsjes, manager of sales planning for the home heating and cooling department.

General Electric Company, Louisville, Ky.—R. Dail Moore, marketing manager of the room cooler dept.

Regional Appointments

MIDDLE ATLANTIC

Electro Mig. Corp.: J. A. Witter, Pittsburgh, Pa., sales representative, western Pennsylvania and W. Va.

Dow-Corning Corp.: C. L. Christiansen, New York manager of electrical industry sales.

Sterling Electric Motors, Inc.: J. W. Byrnes, manager of the new Buffalo, New York, sales office.

The John Hewson Company: Fredric T. Hults, district manager of the new Philadelphia, Pa., offices covering eastern Pennsylvania, Delaware and southern New Jersey.

SOUTH ATLANTIC

Corning Glass Works: Charles L. Day, manager of the new district sales office in Washington, D. C.

Allis-Chalmers Mfg. Co.: D. A. Griffith and D. K. Steidinger, assistant managers of the Washington, D. C., district office.

Jones Metal Products Company: J. A. Lloyd Company, Atlanta, Ga., representative for the Abolite Lighting Division in Alabama, Georgia, North Carolina, South Carolina, Florida and eastern Tennessee.

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BRUSHES

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- ★ Wide Wire Range
- ★ Economically Priced

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Hi-Strength
TERMINAL LUGS

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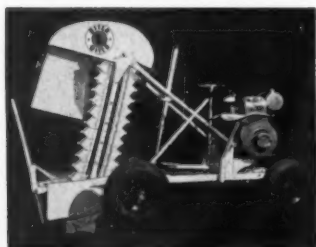
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EARLY BIRDS at 24th Annual meeting of the Minnesota Electrical Association in St. Paul were contractors M. A. (Curley) Oien, Thompson Electric Co., Cloquet, Minn.; and Carl G. Nelson, Commercial Electric Co., Duluth, Minnesota.

EAST CENTRAL

Sylvania Electric Products Inc.: Donn F. King, Cincinnati, Ohio, East Central district sales manager of the parts division.

Independent Pneumatic Tool Co.: Arthur H. Nelson, manager of electric tool sales in the Chicago, Ill., branch office.

S & C Electric Company: Burr T. Carmody, sales engineer for part of Chicago, Ill., Gary, Ind., and the lower peninsula of Michigan.

Jones Metal Products Company: O. N. Fussell, Memphis, Tenn., and Sam Watts, New Orleans, La., representatives for the Abolite Lighting Division in Louisiana, Arkansas, Mississippi and western Tennessee.

Kaiser Aluminum & Chemical Sales, Inc.: J. Carl Ferguson, assistant product manager for electrical conductors in the Chicago general sales office.

WEST CENTRAL

Toledo Pipe Threading Machine Co.: James L. Emch, Kansas City, Mo., sales representative for Missouri, Kansas, Colorado, Nebraska, North Dakota, South Dakota, Iowa, and Cheyenne and Casper, Wyoming.

Cornish Wire Company: Wood & Anderson Company, St. Louis, Mo., representative for Missouri, Kansas and southern Illinois.

Sterling Electric Motors, Inc.: B. G. Jordan, manager of the new Tulsa, Oklahoma, sales office.

WEST

Division Lead Company: Standard Wire & Cable Company, Culver City, Calif., West Coast sales representative.

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- Large stocks on hand of high voltage, lead covered cables not ordinarily stocked by your regular suppliers.
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—for men who plan electrical installations and specify electrical materials and equipment...

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A revised and expanded reference book of up-to-the-minute specification paragraphs covering every phase of interior electrical work—lighting, wiring, power applications, motors and controls, signalling and communications, and electric heating

"INDUSTRIAL CONSTRUCTION CONTINUES STRONG" . . .
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The Master Electrical Specifications Issue will establish a new standard for exact wording in writing electrical specifications and for checking their completeness . . . in accordance with the most advanced practices. It will provide electrical contractors, heads of industrial electrical departments, consulting engineers and architects with an accepted, authoritative reference for planning electrical installations.

Here's Why This Issue Will Be Valuable To You!

1. Each section will be written as specification paragraphs. This means that you can prepare your own specifications by copying directly from this master reference.
2. It will enable you to check on the completeness of specifications prepared by others so that you can present recommendations for changes or additions to sell superior methods or materials.
3. To aid you in your selection of products when writing electrical specifications, all products advertised in sufficient detail to be of real assistance—will be listed in a special product index under general product headings.

Remember! The master Electrical Specifications Issue is coming in July. It hasn't been published since 1949. It won't be published again until 1955.

ELECTRICAL CONSTRUCTION AND MAINTENANCE

A McGraw-Hill Publication

330 West 42nd Street New York 36, N. Y.

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Maintenance—Repairs

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Drill attachment for easy boring in hard-to-reach places, overhead or below, without adjusting.

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Reduced speed for more power.

At your jobber, or write.

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HAYNES PRODUCTS CO., OMAHA 3, NEBR.

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Showing you exactly what
to do and how to do it along
every step of the way

- Unique, specially prepared diagrams and sketches illustrate important principles
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Assistant Professor of Electrical
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Winding changes that must be made if motors are to be operated at different speeds, voltages, frequencies, or combinations thereof
The proper use and size of brushes in direct-current machines

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Procedures to be followed in rewinding armatures for changed conditions of operation

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feature for feature... THIS NEW SQUARE D VOLTAGE TESTER Tops them ALL!

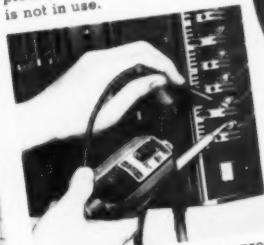
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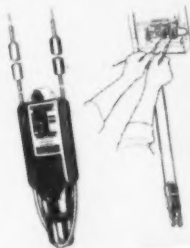
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FOR VOLTAGE INDICATION

NEW, MODERN DESIGN
PLASTIC CASE
WITHSTANDS 10,000 VOLTS

Plastic case designed to com-
pletely house prods when tester
is not in use.



Two-hand testing with one prod
inserted in receptacle. Notice
complete visibility of scale.



Leads drawn through receptacles
for overhead testing. Notice
complete eye-level visibility.

"RUBBER PANTS" PROTECT
LEAD CONNECTIONS TO TESTER

30" HEAVY DUTY
OIL-RESISTING
RUBBER LEADS WITH
SHARP STEEL-TIPPED
INSULATED PRODS

HERE IS DESIGN LEADERSHIP IN ACTION...

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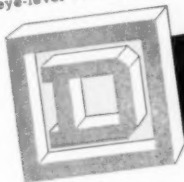
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DETROIT

MILWAUKEE

LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.





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Built to beat the heat

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